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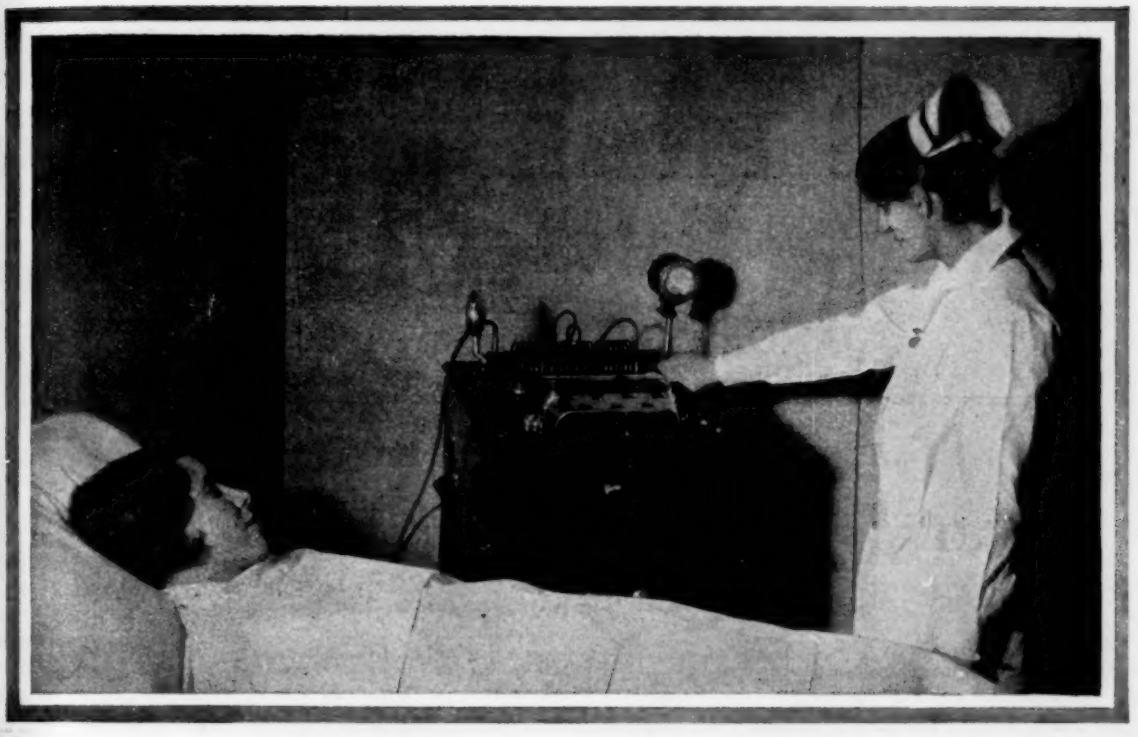

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Disturbed Function of the Shoulder Joint*

By Maxwell Harbin, M.D.

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The admirable papers by Codman[1] published in the Boston Medical and Surgical Journal on subacromial bursitis have been responsible for a great increase both in interest and in knowledge of the common disabilities of the shoulder girdle. Codman differentiated calcification in the supraspinatus tendon from subacromial bursitis. A review of recent reports, however, indicates that this differentiation is but rarely made and thereby justifies an effort to distinguish further that particular clinical disability which is dependent on a degenerative disease of the supraspinatus tendon, accompanied by the deposition of lime salts but not necessarily with inflammation within the subacromial bursa.

During the early period of more accurate observations on subdeltoid, or better subacromial, bursitis, calcification of the tendon was frequently mistaken for a bursitis, due to the failure to recognize that the area of calcification rested beneath the inferior wall of the bursa but outside the true shoulder joint.

Prior to 1906 there is little of importance in the literature referable to this disturbance of the shoulder joint, which was often confused by such diagnoses as subacromial bursitis, arthritis, tear of the supraspinatus tendon, dislocation of the long head of the biceps, fracture of the greater tuberosity of the humerus, or, because of the frequence of radiation of pain down the arm, a brachial neuritis.

The most direct mention of a lesion of the supraspinatus tendon as a cause of disability of the shoulder was in a paper by Stevens[2]. It was his impression that either tears of the tendon or an inflammatory process accounted for the disturbance and, contrary to the present concept, he stated that there was absence of tenderness over the tendon. Previously, in 1906, Dawbarn[3] had described a point of tenderness just above the tuberosity of the humerus, which disappeared under the acromion on extreme abduction, a sign which is rather constant in calcification of the supraspinatus tendon.

In 1907, under a consideration of subdeltoid bursitis, Painter[4] presented X-ray films of five cases, three of which showed definite shadows of increased density over the region of the supraspinatus tendon, unquestionably calcification in the tendon, but described as a thickened bursa; the pathologist, however, reported granules in the fibrous tissue bordering voluntary muscle fibers. In this paper Painter advocated surgical removal in all cases in which the symptoms persisted over six months.

This disability may be associated with a subacromial bursitis, although it is my impression that it occurs alone more frequently. It would appear that there are two types of calcareous deposit which occur around the shoulder joint: one involving the tendon of the supraspinatus alone and the other involving the tendon and the entire subacromial bursa; the latter may occasionally contain only a saculated deposit.

In a series of five cases the two cases with associated

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subacromial bursitis and calcification presented much more acute symptoms than those in which the tendon alone was involved, although it would seem that the patients are just as readily amenable to surgical treatment.

In order for one to have a thorough understanding of this condition, mention should be made of the mechanics of the shoulder joint. It is a true ball and socket joint which embraces two sets of muscles; one connects the shoulder girdle with the trunk and the other the humerus with the shoulder girdle. The inner end of the clavicle articulates with the sternum and gives a bony support to the shoulder girdle at this point. The rest of the shoulder girdle, comprising the remainder of the clavicle and all of the scapula, and bearing the weight of the whole upper extremity, hangs from and is supported and moved by the muscles which pass from it to the vertebrae posteriorly, and to the skull, hyoid bone and ribs anteriorly.

The upper extremity is an organ of prehension and not of support; the shoulder joint, which is the articulation which connects it with the trunk through the shoulder girdle, is constructed with the idea in view of favoring and permitting motion and not of supporting weight or assisting force. The clavicle keeps the joint well out from the side of the body; hence, the neck of the humerus is short. The movements of the arm are so extensive and free that the tuberosities of the humerus do not need to be so large or set so far away from the articular surface as is the case with the femur and its trochanters.

The ligaments of the joints are inelastic tissues; hence, those that enter into the construction of a movable joint must be loose, and the more movable a joint is, the more does its security depend not on its ligaments, but on its muscles.

The muscles have a much more intimate relation to this joint than they have to any other, and this adds to the complexity of the situation. Certain muscles and their tendons pass across the capsule, in some cases blending with it, so that there is the closest relationship between the muscles, the tendons, the capsule and the ligaments. In close relation with the capsule and ligaments, and strengthening them, are the following tendinous structures: above, the supraspinatus; below, the long head of the triceps; behind, the infraspinatus and teres minor; and in front, the tendon of the subscapularis.

In addition to this intimate relation between the tendons and capsular ligament, there are several important bursae in the immediate neighborhood of the joint. The subacromial bursa, between the under surface of the deltoid muscle and the outer surface of the capsule, consists of two parts, a strictly subacromial portion and a subdeltoid. The base of the bursa is attached to the top of the tuberosity of the humerus and the tendinous expansion of the supraspinatus, and the subdeltoid portion of the bursa, which is movable in its periphery and by moving on itself allows the roof to slide in the base. The bursa is variable in size and somewhat over 6 cm. in diameter. Several other bursae exist around the shoulder joint, but since they do not bear on the present topic will not be discussed.

The deltoid, assisted by the supraspinatus, raises the arm from the side. A consideration of the deltoid and supraspinatus will show that the first action of the deltoid in contracting much be to press the humerus up against the acromion and then to abduct, but that the supraspinatus muscle has only one function, that of abduction. Weakness in abduction, therefore, does not mean that it is necessarily caused by a disease of the deltoid, because soreness or pain in the region of the tendinous insertion of the supraspinatus will greatly limit abduction, and Duchenne[5] has reported a case of circumflex paralysis in which the supraspinatus alone was sufficient to produce abduction of the arm.

In those cases in which calcification of the supraspinatus tendon occurs, it is frequently observed that internal rotation and abduction is more painful than external rotation and abduction whether executed actively or passively. This was well illustrated in a case where active abduction in internal rotation was limited to only 35 degrees, whereas with the arm in the position of external rotation, the arm could be carried through its complete range of abduction in a painless manner. An explanation for this phenomenon would seem to be that in the internally rotated position a greater portion of the surface of the supraspinatus tendon must come into contact with the acromion or there is more pressure at this site in this particular position. Impingement of the tuberosity and tendon occurs between 35 and 50 degrees. The failure of the short rotators to perform their function properly may be a factor in the occurrence of this phenomenon in some cases. Stevens has admirably shown how these short rotators of the arm tend to prevent the upward thrust of the humerus caused by the contraction of the abductor muscles.

The etiology of this calcified deposit in the supraspinatus tendon is still largely conjectural, various theories have been advanced, but none has been proved. Inflammation, bacterial or toxic, trauma, either frequently repeated, such as may occur from ordinary abduction of the arm with impingement of the tendon against the acromion or by a direct blow on the prominence of the shoulder or a partial or complete tear of the tendon itself with resultant calcification, may act as an etiologic factor. The histories of these patients rarely suggest either of the latter two possibilities so that it would seem that they might be excluded as the common cause. In a review of five cases, there was no evidence to suggest tear of the tendon, and Carnatt,[6] in a most excellent consideration of this disturbance, gained the impression following fourteen operations that in none of his cases was it due to rupture of the tendon fibers.

The blood supply to tendons is notoriously poor, and it is probable that frequently repeated mild trauma to the tendon may occur as a result of impingement of the tendon against the inferior surface of the acromion on abduction with resultant necrosis of tendon calcification.

Following a searching history, in the above series of patients, severe trauma could not be elicited as a cause, except possibly in one case, and even in this instance the patient gave a history of pain in the shoulder antedating the acute injury some two years so that the latter probably served only to accentuate a preexisting disturbance. In those cases in which the subacromial bursa contains the calcified material, one may easily gain the erroneous impression that staphylococcus pus has been encountered because the consistency and color is not unlike the latter, and to make it even more suggestive increased surface heat and fluctuation over the bursa may be observed.

While the associated involvement of the bursa and spinatus tendon has been considered unusual by those who have drawn conclusions from a larger series than this, one is forced to believe that it must not be uncommon since it occurred in two of this small series of five cases. Consequently it is wise to caution that when the bursa is filled with this material, completely or in part, the tendon also may be affected, and unless it is reckoned with, there is a probability that the patient will not gain complete relief.

Although it is unusual, such a suspension of calicified material may be encountered in any bursa; in an unreported case the author observed both olecranon bursae and a bursa of one knee involved.

SYMPTOMS AND SIGNS

The clinical manifestations of calcification of the supraspinatus tendon ordinarily are clear cut. The age incidence has been given little consideration in the literature; it is interesting to note that no cases occurring in children have been reported. The majority of the patients are between 35 and 40 years of age. The onset is usually gradual, and the patient rarely consults the physician early; pain in the region of the apex of the shoulder joint, occasionally radiating down the inner aspect of the arm, is frequently the first symptom. Later there is limitation of motion evidenced especially by inability to place the hand back of the head. Many patients complain of tenderness over the shoulder and state they are unable to lie on the affected part; at times even the pressure of an overcoat is uncomfortable. A few of the patients discovered that by outwardly rotating the arm they could abduct it without pain. One patient volunteered this information to several physicians whom he had consulted, and because of it one orthopedic surgeon had made a diagnosis of relaxation of the capsule of the shoulder joint.

An ache in the region of the joint is common and frequently prompt a diagnosis of arthritis. Many patients have had teeth extracted and tonsils removed without relief, while others have had their shoulders manipulated under anesthesia by overzealous surgeons who believed they could overcome nature's protective phenomenon.

Stiffness is not an uncommon complaint, and, when combined with pain of an aching character which may be worse during damp weather, is easily confused with arthritis. Fever is rarely ever present, and the leukocyte count is usually normal. The contour of the shoulder joint shows little change; atrophy of the muscles occurs to a limited degree in the more severe cases, and when the bursa is filled with the calcium suspension, fulness at the apex of the shoulder may be observed together with fluctuation; tenderness over the entire bursa may be present. In the uncomplicated case when calcification of the tendon alone exists, tenderness is well limited to a point just below the acromial process. Abduction of the arm is limited to a point just below the acromial process. Abduction of the arm is limited to a varying degree, and there is usually less pain on abduction in external than internal rotation. Contracture of the inferior portion of the capsule rarely occurs unless there is a superimposed periarthritis which is the exception rather that the rule.

Especial emphasis should be placed on the proper roentgenologic technic. During the early days of the treatment of patients with this disturbance, as well as too often at the present time, failure to make a diagnosis has resulted from lack of placing the tube at a proper angle to avoid overlapping of shadows. The patient should lie with the arm outwardly rotated, and the X-ray tube placed over the base of the neck and directed outward and downward.

Calcification in the supraspinatus tendon may occur without symptoms, although I have never encountered it; Carnatt[6], however, has cited several instances.

TREATMENT

The management of these patients is largely dependent on whether the condition is chornic or acute. Obviously, when the calcified material is present without causing symptoms, there is little need for treatment and this group need not be considered.

Patients in this chonic group run a self-limited course, and occasionally the condition clears up without treatment. Heat may allay the pain to a degree. While diathermia has been advocated,—and certain proponents of its use claim excellent results,—as yet no observations made during a follow-up of cases in which the patients were treated in this manner have been published to justify the claims. My limited experience with it has given the impression that no more can be accomplished by the use of diathermia than by the heat obtained from an ordinary electric baker. Massage following the application of heat is helpful, but passive motion and attempts to overcome the muscle resistance is unphysiologic and distinctly harmful since it merely results in increasing the irritability of the part. Active abduction and external rotation is helpful toward overcoming adhesions and can best be carried out by having the patient bend the trunk forward dropping the arms over the head in an attempt to touch the floor with the palms forward.

The conservative treatment in the acute cases seems to me unwise, although if insisted on should be carried out by supporting the arm on a splint in the maximum position of abduction and outward rotation in which the arm can be placed without production of pain. During the period cold applications are usually more comfortable than heat. Since the operative treatment is so simple, offers so little danger and promises complete relief in practically 90 per cent of the cases, one should have little hesitancy in urging it in all cases in which the condition has persisted over a period of months without relief by the more conservative measures.

After operation a plaster spica of the shoulder is applied with the arm in external rotation. The plaster spica is removed at the expiration of ten days and baking, gentle massage of all arm and shoulder muscles and active motion are begun.

The majority of these patients experience immediate relief following operation. This is particularly true of those cases in which only the spinatus tendon is involved.

CONCLUSION

A degenerative disease of the musculotendinous portion of the supraspinatus tendon with deposition of lime salt is considered. The fact that this may occur in conjunction with a subacromial bursa impregnated with the same salts as are seen in the tendon is also emphasized. The etiology has never been definitely established; inflammation, bacterial or toxic, or trauma have been suggested. In none of the five cases considered in this paper could external injury be considered as a cause; frequently repeated mild trauma to the tendon occurring as a result of impingement of the tendon against the inferior surface of the acromion seemed most probable.

The anatomy and mechanics of the shoulder joint are briefly related. The clinical course and treatment are outlined. Emphasis is placed on the concomitant incidence of involvement of the spinatus tendon and bursa. When the bursa is affected, a thorough exploration of the tendon for deposit of lime salt should be instituted and both the bursa and diseased tendinous portion excised.

The good results of surgical treatment in cases uncomplicated by arthritis are demonstrated.

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The Problem of Ankylosed or Partially Ankylosed Joints*

By Charles F. Eikenbary, M.D., F.A.C.S., Seattle, Wash.

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The free movement of any joint depends upon two mechanical factors, both absolutely essential, either one worthless without the other. The first factor is intra-articular, the second axtraarticular.

Intraarticularly we must have smooth surfaces, free from an excess of new bone formation and from tight adhesions. Adhesions may exist and still permit of free motion, provided that these are long adhesions so placed that too great a strain may not be placed on them incidental to motion. Bony growth from fractures or from arthritis may not seriously interfere with motion, provided that the growths are not too extensive and are so placed that locking, or partial locking, does not occur.

Extraarticularly we have the capsule and its attached ligaments and the muscular structures that move the joint. For free motion to occur, the capsule must not be seriously affected and the muscular structures that move the joint must not only be nonaffected but be reasonably free from adhesions.

The two mechanical factors, namely, those that are intraarticular and those that are extraarticular, must be clearly understood and clearly differentiated in any given case for successful treatment to be instituted. Failure to differentiate between the two is apt to lead to disaster.

Changes within the joint are the result of any one of the various forms of arthritis and of trauma. Trauma may result merely in synovial changes, i.e., fibrosis, or it may be carried further and produce a new fracture, on top of which we have a fibrosis. Probably there is no such thing as an intraarticular fracture occurring without some fibrosis, the degree of fibrosis being in proportion to the degree of trauma.

The prevention of ankylosis, or partial ankylosis, is always the end to be sought. Nearly two hundred years ago, the principles of preservation of motions in joints threatened with partial ankylosis were clearly set forth by John Hunter and since that time the principles have never been more clearly stated.

"Hunter recognized the value of movement after sprains and other injuries to joints, and showed that inflammation of the joint, traumatic or otherwise, was accompanied by the outpouring of coagulable lymph and by the formation of adhesions."

To quote from John Hunter, "Nothing can promote contraction of a joint so much as motion before disease is removed. When all inflammation is gone and healing has begun, a little motion, frequently repeated, is necessary to prevent healing taking place with the parts fixed in one position."

Hunter recognized that joint inflammation must always be followed by adhesions, but the parts would stretch and motion again become free by gradual motion and function.

The preservation of motion, following arthritis, is one of the most difficult problems we have to face. All too frequently the problem cannot be solved, and partial or complete ankylosis is the inevitable result. Tuberculous arthritis is not to be considered in this paper, for the reason that the end result to be desired is always bony ankylosis in a good position. Suppurative arthritis or gonorrheal arthritis is likely to produce limited, painful motion. To prevent this, some type of surgical treatment is urgently indicated. Certainly this is true in the suppurative arthritis, and I am inclined to think the same thing is true in gonorrheal arthritis.

The mild suppurative arthritis, due to staphylococcus albus, very frequently may be speedily controlled by aspiration and absolute rest. Following this, when the disease is a thing of the past, gradual motion—never under an anesthetic—will restore the joint to normal.

In these severe types of suppurative arthritis, it is my opinion that the treatment of Cotton should be given a trial, especially in the treatment of knee joint infections. This consists in making a very small opening through the capsule, a quarter to a half inch, followed by irrigation with a large quantity—a gallon or more—of mild antiseptic, the flushing being continued until the fluid returns quite clear. The wound is then tightly closed and the part put to rest. Several times I have carried out this procedure in suppurative knees with perfect results in every instance.

The innumerable forms of nonsuppurative arthritis have a tendency to lead to limited motion, usually painful, or to no motion, usually not painful. Naturally the first step in the preservation of useful motion is to eliminate the cause. I need not tell this group that this is a search in the dark, or at least in the late twilight. Possibly when we become more enlightened, we may look upon abscessed teeth or infected tonsils as a result rather than a cause. It may be that the colon is the source of many of the arthritides, or perhaps the food has something to do with it. What part does constipation play? I do not say that infected teeth or infected tonsils are not a frequent cause. I am merely wondering if our search has gone far enough.

Regardless of cause, limited joint motion or ankylosis may result. So long as the disease is active and progressive, the treatment is supportive and symptomatic. Many measures are used, most of which are of doubtful value. Some of them apparently have real merit, while many are obviously so worthless as to deserve no consideration by this society. I shall not go into this phase of the treatment.

When the disease has spent itself, leaving a joint that is partially ankylosed and usually painful, we may take stock of the situation and map out a campaign. If we are fortunate enough to have left a joint with practically normal joint space, we may accomplish a complete or nearly complete cure by the usual method of massage, active and passive motion, gradual stretching in a brace or divided cast, never carrying the motion to the point of producing much pain, and never under an anesthetic.

I know of no mysterious light or electrical current that will dissolve adhesions, or that has any appreciable effect upon cases of this sort. The adhesions must stretch and stretch gradually, or they must be broken without enough force to produce hemorrhage and, therefore, more adhesions. To produce motion forcibly, under an anesthetic, is without doubt the worst thing that could be done with such a joint. Where the joint space is considerably narrowed and the formation of exostoses is fairly numerous, a complete synovectomy, especially in the knee, is well

*Read before the Thirty-ninth Annual Meeting of Washington State Medical Association, Seattle, Wash., Aug. 27-30, 1928.

worth considering. It should be complete, every vestige of synovia being removed. This should be followed by the usual active and passive motion, stopping short of much pain and never being carried out under an anesthetic.

You will obtain some good results. You will have some failures. The worst that can happen is a return to the former condition, in which case you have left either an arthroplasty or an arthrodesis. The joint that becomes quiescent, with a marked narrowing of the joint space and is still painful, should have either a successful arthroplasty or an arthrodesis in a good position. It may not be painful, in which case it certainly should be left alone, provided the position is useful. The ankylosed joint, especially in a bad position, should either be ankylosed in a more useful position, or have an arthroplasty.

Whether or not to do an arthroplasty must depend upon the condition of the other joints. If both hips are ankylosed, some type of arthroplasty of one is almost imperative. If both knees are ankylosed, it is wise to attempt an arthroplasty of at least one. In ankylosis of the elbows, one or both, an arthroplasty offers every chance of success. Here the chances are better than in any other joint in the body. Where a single hip or single knee is ankylosed, or partially ankylosed, I would have considerable hesitancy in advising an arthroplasty. I have seen many so-called successful arthroplasties of the hip and of the knee. A few were quite wonderful, but in many of the instances I am just a little bit inclined to think that I would have preferred a stiff, painless joint in a good position.

In the joint with a limited motion, following a fracture into the joint, we have the same indications for restoration of motion that we have in the arthritic cases and for the same reason. Here we are dealing with intraarticular adhesions plus some contraction of the capsule, plus a moderate amount of muscle adhesions. The adhesions in the muscles are not serious and call for no treatment other than that given the intraarticular adhesions. Brisement force has no place in the treatment of a joint partially stiff from intraarticular fracture. To apply force sufficient to justify an anesthetic in order to break up adhesions can only mean injury to the capsule, hemorrhage from the capsule and from the adhesions, increased pain, and a greater number of adhesions, denser than the ones that you have just broken up. I know of no better way to defeat your purpose than the use of the very procedure I have just condemned. It is quite possible that you may never succeed in completely restoring the motion in the joint. But passive and active motion, plus a force that stops short of severe pain, will give you far better results than you may ever hope to attain by applying force under an anesthetic.

Limited motion in joints, following a fracture above the joint, is a condition that is frequently misunderstood. In no other way can we account for the treatment that is frequently given such cases.

Why is the joint motion limited? Certainly not by any serious changes in the joint. The changes in the joint are so trivial that they may be disregarded. The real difficulty lies in the adherent muscles above the joint. Especially is this true following a fracture of the femur that has had an open operation.

There is a fallacy that runs through medical practice, but not through medical literature, that motion in the involved joint may be restored by forcibly bending the same, under full anesthesia. What happens when this procedure is carried out in the case of a knee, for example? The most favorable thing is that the muscles may stretch sufficiently so that flexion of the knee may be produced. The likely thing is that the muscles and fascia, and possibly the capsule, may be torn in various places, which completely defeats the purpose of the procedure. Tearing of the muscles necessarily means more fibrosis, more adhesions, and a knee that is more limited in its motion than it was before. The unfortunate result is all too frequently a refracturing of the femur or a fracturing of the patella. I personally know of ten cases of fracture of the femur, from this procedure, three cases of fractures of the patella, and one case of sudden death from pulmonary embolism.

The procedure is unsound physiologically and mechanically and should be relegated to the scrap heap. Given an elbow markedly contracted from extensive burns at the bend of the elbow, would any surgeon attempt to restore that elbow to normal by forcibly tearing the scar to pieces under an anesthetic? And yet such a procedure seems to me to be no less absurd than that of applying great force under an anesthetic, in an attempt to restore the partially ankylosed joint. Gradual motion, active and passive, force that stops short of severe pain, these will give you a good result, whenever it is possible for a good result to be obtained.

SUMMARY

The chief object of this paper is to bring before you for condemnation, a surgical procedure that is quite common and which is unsound in every way, in my opinion.

The Use of Physiotherapy in Arthritis

By R. L. Jeffery, M. D., Seattle, Wash.

In the course of a year the physiotherapist meets a great variety of conditions in his work. The great bulk of these cases have to do with some joint disorder. A large number are traumatic either directly affecting the joint or the structures surrounding the joint. He also meets a great number of inflammatory conditions of joints—either chronic or acute arthritis.

The Physiotherapy treatment of the traumatic joint I believe is fairly well standardized but the treatment to be used on inflammatory conditions of joints is not as far as I know. In fact there is a great deal of uncertainty as to the methods to be employed in most of these conditions. It is only natural then that the physiotherapist's thoughts are turned to what are the most valuable methods to be used. Before attempting to arrive at the answer to this question let us inquire into the nature of these inflammatory conditions.

The subject matter of this article is to concern for the most part the ordinary chronic types of arthritis which form the great mass of cases seen by the physiotherapist.

To thoroughly understand a disease there are four points to consider.

(1) What is the cause?

(2) What is the mechanism of the development of the disease?

(3) What are the pathological conditions present?

(4) Through what process can the disease be cured or controlled?

Cause, or etiology. There can be little controversy in these days as to the etiology of arthritis in general. It is infection. The type of organism which is usually responsible in the ordinary case of arthritis is the streptococcus. Occasionally however, a staphlococcus albus and aurius, colon bacillus, gonococcus etc. may enter into the picture. The streptococcus takes innumerable variations upon itself but we can consider generally that the pathogenic streptococcus may be divided into two general groups—the viridins type and the hemolytic type. These again are divided into other groups. Some of these varieties of viridins and hemolytic streptococci have peculiar properties of affecting joints, muscles or ligaments. Others have an affinity for nervous tissues. These are the types of organism which give us the usual inflammatory condition of joints. This has been demonstrated repeatedly by innoculating animals with these various strains. Animals so treated will develop within a short time a typical arthritis or neuritis.

The primary infection is seldom if ever located at the site of the joint involved but at some distant point or focus. There may be one or many different foci. These foci include tonsils, teeth, gall-bladder, colon, appendix, pelvic organs, prostate or mediastinum. The original entrance of the germ into the body may occur in various ways. First through colds or ordinary tonsillitis, through influenza or grippe, through infectious diseases or may be ingested with contaminated food or drinking water. Various organisms may enter through subsequent infections until there are many varieties present.

It is undoubtedly a fact that these germs may be dormant in a patient's body for years without causing arthritis. It my opinion that there are various strains of these germs which can cause arthritis harbored in the patient's body at one time. The germs undoubtedly reach the joints by way of the blood stream. The question then arises as to what prevents the immediate occurrence of an arthritis in a patient who has these arthritis forming organisms established in his system. The answer is immunity which the patient begins to develop with the entrance of these organisms into the body. Like most other types of immunity this is specifically developed toward these organisms which are present in the various foci. The immunity is maintained while the patient leads his normal existence but if any circumstance or condition occurs which depletes sufficiently the blood immunity one or more of these organisms may reach a joint with sufficient vitality to set up an actual inflammation in the joint. It is at this point that the patient begins to feel symptoms. On the other hand the organisms may reach certain joints in a greatly devitalized condition and may set up such a chronic inflammation as to go unnoticed by the patient. His only symptoms may be a little stiffness in the morning without pain. Thus we have developed considerable pathological changes in the joint without the usual symptoms of arthritis.

That in a really painful arthritis there is actual infection present at the joint can be shown in many cases by asperation of these joints and the culturing of the organisms present. Some times instead of the joint itself being affected muscles or nerves may be involved and we have instead of an arthritis, a myositis or what is commonly called muscular rheumatism. On the other hand the nerve may be affected by an inflammatory process within the nerve itself or through inflammation at the root of the nerve or along its course and we have a neuritis or neuralgia.

The pathological changes which take place in an arthritic joint depend somewhat on the type of infection present. We may have a proliferation of new bone thrown into the joint and about the joint or along the ligaments of the joint. We may have thickening and actual disease in the synovial membrane or joint lining with free fluid thrown out into the joint itself. We may have inflammation of the bursa surrounding the joint with fluid in the bursa. We may have inflammation of the belly of the muscle with infiltration and later fibrosis and often the presence of hard nodules which are easily felt by the fingers in the more exposed muscles. Frequently much of the stiffness in arthritic joints is due for the most part to the muscle inflammation.

One very important point to remember is that with these various changes taking place in muscles, joints, etc., the vital organs of the patient very seldom escape the bombardment of germs and toxins. This accounts for the general debility so frequently found in the chronic arthritis patient.

An important point which should be considered here is the presence of constipation in these cases. There is some question as to whether the constipation is caused by this infection or whether it develops from other reasons and then disseminates infection into the blood stream. It is my opinion that certain changes take place in the wall of the colon due to the presence of infectious germs within this organ. This condition gives rise to a hypersensitiveness of the colon followed by a spastic type of constipation. This condition, of course, prevents nor-

mal emptying of the colon and allows putrefaction to take place within. The abnormal operation of the colon also must augment the absorption of germs of the blood stream and we have eventually the establishment of a vicious cycle.

The treatment. As to whether a patient suffering from chronic arthritis can be cured depends upon the age of the patient, the type of disease and the length of time the disease has existed as arthritis. As can be seen by the forgoing subject matter arthritis should not be considered as a local disease of joints, at least not at the beginning of the affection. Arthritis should better be considered as a body infection of chronic type which is manifest by joint symptoms. In the later stages of the disease the joint manifestations become a serious problem and can be more nearly considered as a joint disease. If the theory of chronic infection of long standing prior to the onset of symptoms is accepted, than an attempt at reimmunizing the patient against this infection should be the paramount object of our treatment.

I believe that the system of treatment as developed by Doctors Burbank and Hadjopoulos of New York is the most logical and hopeful which has been developed up to date. This treatment is designed to locate and culture the organisms which are causing the joint flare up. These organisms are used then as vaccines or derivaties therefrom to reestablish specific immunity by the reinoculation of the patient with these products. This method if properly applied will develop actual and proven immunity toward the offending organisms. The technical difficulties in obtaining and proving these specific organisms are somewhat intricate and cannot be properly followed without considerable study, thought and equipment. Although the theory may lend itself to some arguments yet the fact remains that it works out in practice. With this step of reimmunization accomplished, the battle is well on the way towards being won. Other methods of stimulation are of course in order if the best results are to be obtained. The question now arises as to which physiotherapy appliances or methods are to be used in assisting in our rehabilitation programme.

There are three types of Physiotherapy treatment which I think are of considerable value. First, properly given high colonic irrigations. Colonic irrigations should not be used routinely but only in cases where unquestionable retention of fecal matter is noted. I do not recommend any fancy apparatus which attempts to introduce the irrigating tip into the caecum. I do not believe that this is necessary because the reverse peristalsis of the colon unquestionably carries enough fluid back into the caecum to soften any impacted material and aid in its expulsion. The method I recommend is very simple. Eight or ten ounces of warm fluid either saline or weak sodium bicarbonate solutions are injected into the rectum and then allowed to pass out through the tube. This process is repeated many times and it is surprising the amount of fluid which will pass back and forth between the caecum and the rectum. This method eliminates the dangers of bruising and otherwise injuring the delicate mucous membrane of the colon by forcing a tube far up through the lumen of the colon and I believe it does the work just as efficiently.

The second appliance or treatment I recommend is Ultra Violet Ray. I think there can be no question that the proper irradiation with Ultra Violet Ray goes far in building up general body resistance and body tone besides assisting in necessary restabilization of normal calcium metabolism. I recommend using Ultra Violet Ray courses of two months each working up as rapidly as possible to the ultimate body tolerance of the ray. The treatments are given three times a week for two months after which a rest period of two months is given.

The treatment is Diathermy for the abdomen in cases where any abdominal distress is felt by the patient. I have found this particularly advantageous in spastic colitis and in cases of sluggish liver.

Diathermy and Ultra Violet Ray applications directly to the joints have not met with success in my practice. In fact many cases seem to be definitely made worse by these methods. In old contractures however in a quiescent arthritis Diathermy may be of some benefit. I have also given up the use of massage locally as I found that it frequently stirs up a condition which is quieting down normally. Galvanism also has not met with success in my practice.

I have not gone into the orthopedic treatment of arthritis as that is almost taken for granted these days. We should always of course apply immobilization, etc., where it is definitely indicated. Summary:

In these sketchy remarks I have endeavored to bring out the following facts.

1. Arthritis is due to chronic infection usually of the streptococcal type.
2. The joint pain and swelling are merely symptoms of the infection.
3. That the treatment should be primarily an attempt at reimmunizing the patient against this infection and an attempt at rehabilitation of all normal body function.
4. That there are three types of Physiotherapy treatments which I have found beneficial:

1. Colonic irrigations.
2. General Ultra Violet irradiation.
3. Abdominal Diathermy.

Hydrotherapy in Connection With Nervous and Mental Diseases

By Martha Kearney, Physiotherapy Department, City Hospital

During the latter part of the seventeenth century at York Retreat in England, Wm. Tuke fully demonstrated that mechanical restraint is seldom necessary, in the treatment of mental and nervous cases, that kindly personal attention, outdoor exercise, occupational therapy and hydrotherapy are much more conducive to rational behavior, and that the best form of restraint is self restraint. After a trial of fifteen years of actual experience with this new method of therapy, a publication in 1813 aroused international interest in what came to be familiarly known as moral treatment. This was the beginning of a new era in the treatment of the mentally sick.

Hydrotherapy, one phase of this so called moral treatment, we consider to be one of the most important. Its great versatility and convenience in adaption to various conditions, through the almost infinite variety of procedures which it affords, makes it useful in almost every form of mental disease. In the treatment of psychoses, the general principles are applicable as in any other type of disease. Disorders of various organs are found in the psychotic, as among the normal, and require the same sort of treatment.

In our work, the patients are classified in three main groups in regard to hydrotherapeutic treatments, the disturbed, the depressed and catatonic and the toxic psychoses. The various measures used have eliminating, stimulating and sedative effects, as the case may be. The excited, agitated and violent type that may occur in the delirium of fever, is of short duration, while here in the realm of mental disease these conditions may persist for weeks, and require treatment a longer period of time. In the absence of hydrotherapy, the usual means of dealing with these cases is by manual or mechanical restraint, which is undesirable when it can be avoided.

In treating cases of excitement, continuous baths give best results. The patient is oiled, placed in a tub filled with water at a temperature of 94-96 deg. F., with a continual inflow and outflow of water. A rubber pillow for the head, leaving free movements of the extremities while in the water. When treating uncooperative patients, the tub is covered with stout canvas. This treatment may be given from a period of 1 or 2 hours to 24 hours. Constant attention is required—the quality of pulse should be noted at frequent intervals—watching for any pallor or blueness of lips—or any suicidal tendency, as an attempt to drown. The temperature of the water is watched very closely, two thermometers being used, one attached to the mixing chamber, and an ordinary bath thermometer. Fluids are given regularly, and quietness is conducive to the best results. While a very disturbed patient may object strenuously at first to this form of treatment, by a vigorous splashing of water, etc., it is remarkable how sometimes they seem to like the sedative effect of the water, and ask to be put in the tubs again.

The continuous bath is also of advantage in caring for the skin. The patient resting in water which is of higher specific gravity than air, permits a large proportion of the pressure to be removed.

For the depressed and catatonic type of patient, the needle spray and Scotch douche are used with desirable effect. The water strikes the body from every angle, and at varying degrees of temperature and pressure, producing stimulation. We find each case must be treated individually as to degree of temperature tolerated—starting with water at a temperature of 98 degrees and with a pressure of 10-15 lbs. It is sometimes necessary, in very resistive cases, to have the patient held in the shower, until he becomes accustomed to what we are trying to do for him. When the operator has once gained the confidence of the patient, there is little difficulty in giving the treatment for the prescribed length of time, and at gradually lowering temperature. The needle spray is given at a temperature of 85 deg. for 8 minutes. The Scotch douche for 2 min. with the hot water applied steadily and slowly at 110 deg. from the base of the spine to the neck, immediately followed by cold water at a temperature of 80 degrees. After the spray and douche, the patient is dried, given friction over the back and extremities and encouraged to rest on the table for 10 minutes, following which moderate exercise is indicated.

A very small proportion of these cases show a poor physical reaction. If a chilly sensation, and goose flesh appearance on the body persist after thorough drying friction has been applied, the treatment is discontinued, at least temporarily.

Our routine treatment of alcoholism consists of the immersion bath at a temperature of 100-112 degrees, for approximately 10-15 minutes, or until the desired effect is produced. The patient is then placed in a dry blanket pack until he perspires profusely, which as a rule requires about 20 minutes. An ice compress is applied to the head, and hot water bottle to the feet while in the pack. Water is given to drink freely. The blood pressure is taken before and after the treatment, and the pulse rate watched continuously. This procedure is given for 4 consecutive days and sometimes for a longer period, depending upon the individual case. If the physical condition is good, this is followed by a stimulating spray.

In the treatment of narcotism, the procedures consist of the cabinet bath at a temperature of 100-130 degrees, the length of time varying from 5-20 minutes. This is followed by a sitz bath at a temperature of 100-120 degrees for 15 minutes. This assists in relieving the pain which is complained of in nearly every case. The stimulating needle spray is then given followed by the Scotch douche. The patient is rubbed with alcohol, and rest in bed is encouraged. Upon retiring a sedative bath is given. This is similar to the continuous bath except that the temperature of the water is 98-100 degrees and the length of the time is shorter, never more than 1½ hours. If the temperature exceeds 98 degrees the length of time should be shortened. These procedures are given for 6 consecutive days.

Hydrotherapy has become an important part of the treatment employed in most of the public hospitals, and in the larger private institutions it is almost indispensable. This form of therapy in combination with physical education and recreation makes life in the large mental hospital more healthful and enjoyable than is possible for most persons at large.

It is evident in tracing the course of medical treatment in mental hospitals that hydrotherapy, recreation, and occupational therapy are rapidly replacing mechanical restraint.

Physical Therapy in the Treatment of Fractures

By K. G. Hansson, M.D.

Read before the Orthopedic and Industrial Section of the Cleveland Academy of Medicine

Physical therapy is the application of physical means in the treatment of human ailments and has received so much publicity since the late war that we may compare it to an overadvertised drug trying to graduate from new and non-official remedies to U. S. Pharmacopeia. Physical therapy received its official recognition when, in 1926, the American Medical Association appointed its council on Physical therapy. The first report from this council states that the physical measures that have been found to have certain therapeutic value both by long clinical experience and by laboratory research include:

1. Heat, both natural and artificial.
2. Hydrotherapy.
3. Light.
4. Electricity.
5. Massage.
6. Therapeutic exercises.

The council recommends further that the following considerations should receive the most careful attention of the medical profession:

1. Physics, physiology and biochemistry must be called on to dispel the empiricism of the past and to prove the true scientific value of various physical agencies.

2. Physical therapy must be recognized as a definite part of medicine, to be practised and controlled by graduate physicians.

3. Since physical therapy is a definite part of medicine, every medical school should give a thorough training in this subject.

4. Persistent, prolonged effort must be made to eradicate the abuses of physical therapy. A physician who has installed a diathermy machine or an ultra-violet ray generator can do good in carefully selected cases with one of these methods. He is not, however, fully equipped to render physical therapy. The "treatment habit" is a menace, prevalent in general practise and reaching its zenith in the physical therapeutic departments of civil hospital. The training of technicians should be encouraged, for trained technicians are invaluable to physicians.

Such is the bird's eye view of physical therapy in its present transitional stage.

The treatment of fractures is probably the most fascinating work in orthopedic and industrial surgery. Very able books on fractures have been published, but the few notes they contain about the after-treatment are hazy, often misleading, and the therapeutics advocated are empirical to say the least.

To prove how physical therapy is the application of physics and physiology, that every doctor should know, to what he knows about pathology, we shall attempt to show how one can synchronize the chronological bone repair with the application of physical means. What takes place when the continuity of a bone is destroyed by violence, and how can we help the repair? For practical purposes, we will divide the answer to these questions into five stages.

First Stage. The immediate result of a fracture is a hemorrhage which is central, subperiosteal and muscular and may extend along fascia and subcutaneous tissue. This hemorrhage produces the clinical symptoms of pain, swelling and muscular spasm. These three symptoms indicate clearly nature's attempt at immobilization and, after the best possible reduction has been accomplished, our efforts should be to maintain this reduction by effective, but no constricting, immobilization. The immobilization of the fragments is so important in this first stage of repair, that any attempt at relieving the pain, muscular spasm or swelling by gentle effleurage, as advocated by Lucas-Championniere, thereby jeopardizing the reduction, seems neither rational nor safe.

Second Stage. A few hours after the fracture, a productive inflammatory process begins which, through the granulation tissue formed and the exudate of fibrin and serum, changes the hemorrhage into a hematoma. The clinical symptoms of pain, swelling and muscular spasm persist and they tell us to keep our hands off and maintain the immobilization.

Third Stage. Forty-eight to seventy-two hours after the reduction the blood clot surrounding the fragments is further organized by connective tissue that has grown in from the periphery. Osteoblasts appear on the stage and some bone matrix is formed from the intracellular substance. By this time, the pain and muscular spasm have disappeared and swelling decreased.

Fourth Stage. On the fourth or fifth day, we have a soft callus consisting of osteoid tissue. The calcium salts (calcium phosphates and calcium carbonates) are deposited in the connective tissue stroma of the perivascular areas. These salts are carried in the circulation by colloids and by carbon dioxide and are also available from the fractured ends of the bone by a process of demineralization and atrophy. The calcium phosphates and calcium carbonates are in solution in an acid media. It is, therefore, believed that the hydrogen-ion concentration becomes lowered, and when this reaches a certain point below that of the blood plasma, precipitation of the calcium salts occurs. If, at this stage, the splintage permits, it is easy to see how the application of heat will help to restore the condition of the soft parts about the fracture. The physiological action of heat, however, also tends to lower the hydrogen-ion concentration of the blood and, therefore, is helpful in the precipitation of the calcium salts.

Fifth Stage. Between the second and the third week, the connective tissue is well organized and new blood vessels are seen. Osteoid tissue appears in the perivascular areas and there is a gradual transition in the appearance of the cells from connective tissue to osteoid tissue to bone.

The absorption of the excessive callus begins and there are signs of the re-establishment of the bone marrow.

At this stage, the patient often complains of stiffness in adjacent joints and the soft parts about the fracture are described as being without life. Now we are dealing with a convalescing joint where the bony repair has gone on to a soft callus and there is no muscular spasm, swelling or pain which contraindicates manipulation.

By using these observations as a criterion for the after-treatment, it seems rational to fix the second week after reduction as the beginning of the after-treatment. This is only approximately and has to be modified for each case.

The after-treatment consists of external heat, internal heat by means of diathermy, massage and therapeutic

exercises. It seems justifiable to review briefly the physiological actions of these physical means.

HEAT

The calorific or heat rays make up the red rays or the least refracted rays of the visible sun-spectrum and, also, the invisible infra red rays. In the electro-magnetic spectrum, they are found to have a wave length of from 3800 to 9000 Angstrom units. Other properties, besides refraction, are reflection, absorption, penetration and polarization.

When heat in any form strikes the human body, there is an increase of the surface temperature. To protect the body against any excessive increase of heat, the heat-regulating mechanism responds with a hyperemia. The capillaries are dilated, heart action is increased and the circulation accelerated. Thereby, some heat is carried into the systemic circulation and some is eliminated through the more rapid respiration. The sweat glands increase their activity and begin to eliminate and everything tends to keep the body temperature at a constant level. On application of heat, the musculature relaxes and the sedative effect on the sensory nerve-endings is well known and, probably, also acts reflexly on deeper structures.

The reaction of the sweat, saliva and urine shows first increased acidity and later alkalinity. The reaction of the blood becomes less acid or alkaline as measured by the hydrogen-ion concentration.

The practical application of external heat may be divided into conductive heat and convective heat. *Under conductive heat,* we include all measures where the source of heat is in direct contact with the skin. Hot applications and the different forms of hydrotherapy belong here. The whirlpool bath, where the water under 50 lbs. pressure and heated to about 115° F. is led into a basin, producing a whirl, is the method to prefer. The cleansing effect of the water, the heat and the molecular massage of the activated water is of great benefit to a limb that has been encased in plaster for some time.

Convective heat consists of exposing the patient to any source of heat at a distance from the body.

DIATHERMY

In addition to the conductive and convective heat, we speak of conversive heat, which means heat produced in the tissue by means of its resistance to a high frequency current, oscillating between two electrodes. The diathermy current used therapeutically has a voltage of 1000-10,000 and an amperage of 200-4000 milliamperes. The oscillations vary from 1,000,000 to 2,500,000 per second. These rapid reversals of the current prevent the occurrence of any chemical effects or any neuromuscular responses. The therapeutic value of diathermy is, therefore, based solely on the development of heat.

Although the question of where the maximum heat is produced is not settled, it cannot be denied that heat is produced in the path of the high frequency current. This is especially true, where the distance between the electrodes is usually less than 10 cm. and the amperage varies from 500-1000 milliamperes, with the relatively higher voltage delivered by the latest diathermy machines. This secures a high current density. By current density is meant the amount of electrical units per square section of the medium, and this current density is a necessary factor in the production of conversive heat.

MASSAGE

The main physiological effects of massage are:

1. Assisting the circulation.
2. Aiding the movement of lymph.
3. Exerting tension on some structures which we hope to free or stretch.

The absorption time of intradermal saline, when treated with massage, was ten minutes, compared with sixty minutes for the untreated injection.

Championniere has studied the histological changes that take place when soft tissues are crushed. He found:

1. Dissociation into fibrillae of muscular fibers, as shown by well-marked longitudinal striation.
2. Hyperplasia, sometimes a simple thickening of the connective tissue.
3. Increase in places of nuclei in connective tissue.
4. Interstitial hemorrhages.
5. Enlargement of blood vessels with hyperplasia of their adventitious coats.
6. Multiplication of nuclei in the sarcolemma, resembling interstitial myositis.

When massage was applied to these tissues, he found the following histological picture:

1. Muscle appeared normal.
2. No secondary fibrous bands separated the muscle fibers.
3. No fibrous thickening around the vessels.
4. General bulk of muscle was greater.
5. There was no sign of hemorrhage.

The therapeutic application of heat produces a loss of acid or an alkalosis as mentioned above. The acid base equilibrium also undergoes striking changes in exercises, as shown by Barr and his co-workers. The result in exercises being an acidosis, due to the production of lactic acid and CO_2.

The effect of massage on the body fluid reaction, according to Peberton, is a restoration to normal. The application of massage should be left to technicians chosen for their skill rather than their personality. Supple and warm hands, with an educated sense of touch, are preferable to great strength. Any hard massage that calls forth a protective contraction is an error in technique. A good way of judging a technician is by the way she places the patient for the treatment. The patient should be in a position that permits the utmost possible relaxation, and that is the recumbent position. This applies to the treatment of the upper extremities as well as any other part of the body. The kind of lubricant a technician uses usually shows her experience. For any normal skin, a lubricant with a fatty base is best, but when a skin shows tendencies to eruptions about the hair follicles, a soft powder is preferable.

THERAPEUTIC EXERCISES

The physiology of exercises or muscular contractions may be reviewed as to their local and general effect, but in relation to fractures only the local effect is of interest to us. In order to get a muscular contraction, we must have nerve stimuli, the contractility of muscle fibers and the fuel of carbohydrate and fat. The physiology of muscular contractions may be divided into:

1. Mechanical, which is produced by means of approaching the muscle's origin and insertion on skeletal parts, which act as levers.
2. Metabolic. The muscle utilizes carbohydrate and fat for its contraction, leaving as waste products lactic acid and CO_2, which are probably responsible for muscle fatigue. Protein is mainly repair material.
3. Thermal. An increase of temperature always follows muscular contractions.
4. Electrical. There is some change in the electrical potential of the muscle, preceding and following the contraction.
5. Functional. By systematically continued muscle contractions, there is an increase of volume, tonicity and power of the muscle.

In the after-treatment of fractures, we make use of the mechanical effect of muscle contractions, because of

their pull on the skeleton, in order to prevent or correct deformity.

Sir Arthur Keith has formulated the relative function of muscles and ligaments of the joint, when he says: "Ligaments come into action only when the normal muscular support and defense of a joint has broken down." When we realize the physiological truth in this statement, we can understand how irrational it is to advise a patient with a flexion deformity of the elbow as follows: "Go home and carry a heavy weight in your hand, and the elbow will straighten out." The patient carries the weight as long as the flexor muscles of the elbow permit and then drops it. If he is conscientious, he repeats it often and develops strong elbow flexors, which only increases the deformity by counteracting gravity, which if left alone might have corrected the deformity.

Exercises may be divided into active, passive and resistive.

By active exercises, we mean voluntary contractions of muscles by the unassisted patient. During the first week of treatment, the patient goes through the motions of the joints adjacent to the fracture to the best of his ability.

Passive exercises comprise exercises performed on the patient by means of apparatus or by a technician.

Resistive exercises are performed by a technician in co-operation with a patient, or by the patient herself, using her body weight or some apparatus for resistance. In the second week of treatment, these resistance exercises can be started.

It is evident that any treatment such as we have attempted to outline has its limitations. It can be given only in a well-equipped department of physical therapy. It is practical to give such a treatment only once a day or every other day. That means one hour of treatment out of twenty-four or forty-eight hours of inactivity. As soon as immobilization is dispensed with, the patient begins his home treatment.

CONCLUSIONS

In conclusion we may state that the immobilization of fractures carried on too long is responsible for longer after-treatment and, usually, incomplete return of function. The question of when to start the after-treatment, therefore, comes up, and we have tried to answer this by using the physiological bone repair as a criterion. This should suggest the second week after the time of reduction, as a safe time for the beginning of the after-treatment.

1. Early application of heat and active motion to the injured part promotes early functional restoration.
2. The after-treatment should not be entrusted to technicians without supervision. It should include physical means, the physiological action of which is well understood and well conducive to nature's way of healing and restoration.
3. Any treatment by physical means that may require one hour out of every twenty-four or forty-eight hours is insufficient and of little avail, if it is not followed up by some home exercises, which can be repeated every two or three hours.

Officers and Executive Committee of the American Physiotherapy Association, 1929-30

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EDITORIALS

The officers and members of the American Physiotherapy Association have lost a friend and supporter in the death of Doctor W. B. Carr of Washington, one of our honorary members. He helped to guide our way in the army and continued his keen interest in our profession in civilian life. Up to within a few days of his death he was active in formulating the type of legislation he felt to be desirable for the "P. T.'s"—an inspiration for those talking with him. VALE.

First Call for Convention

The ninth annual convention of the American Physiotherapy Association will be held in Detroit, Michigan, on June twenty-third, twenty-fourth, twenty-fifth and twenty-sixth. The officers will preside, the regular business of the association will be transacted and the votes will be cast by properly accredited delegates and proxies. This is to be one of the most important meetings in the life of our organization and your attendance is strongly urged. HAZEL FURSCOTT, President.

It is not too early to begin your plans for the convention to be held in Detroit, Mich., June 23, 24, 25 and 26. The newly organized Michigan Chapter will be the hostess.

The Fort Shelby Hotel has been secured as the location of headquarters and all meetings except clinics will be held there. Room arrangements may be made through Mrs. Edna Dinieus, 1402 David Whitney Building, Detroit, Mich., by writing to her and stating whether you want a single or double room and approximate price. Mrs. Dinieus will refer your letter through the proper channels. Following are room rates:

$3.00 rooms, single or double with bath.
$2.50 rooms, with bath.
Y. W. rooms—$1.50, running water.

It may be possible to secure other rooms as low as $1.75 and $2.50.

Rates on railroad tickets will be the same as offered the A. M. A. Such rates will be printed in current numbers of the A. M. A. May we suggest that you be sure to ask for your certified receipt when you buy your ticket?

There will be a visit to the University Hospital, Ann Arbor, where a clinic will be held. The round trip will be $2.00, including a 15 minute ride around the town and campus.

Of course, there will be a banquet, so be prepared and bring along your party gown.

The A. M. A. will be in Detroit at the same time, so rooms will be difficult to get.

Plans are being made for a large attendance, so make your reservations and plans now!

Detroit, Mich., Feb. 6, 1930.

Fellow Members:

The Michigan Chapter hopes you are all planning to attend the convention in June. Our chapter is very young, having only recently been organized, but with the enthusiasm of youth we are looking forward to entertaining you.

An exceedingly interesting program is being prepared by the program committee and although at this time it is not at all complete the following prominent people have already promised to speak: Dr. Leroy Hubbard of Warm Springs, Dr. Fred Kidner of Detroit, Dr. Hodgens of Grand Rapids, Dr. Willis Peck of Ann Arbor and Dr. Henry Colond.

Several clinics have also been planned one of which is to be held at the University Hospital in Ann Arbor, that well known little town, forty miles from Detroit, which is the home of the University of Michigan.

Let me extend to each one of you a cordial invitation to visit Detroit and we will do our best to see that you have an enjoyable as well as a profitable convention.

Very truly yours,
ANNA L. MULCAHEY, President.

At the last executive meeting of the Cleveland Chapter a legislative committee was appointed for "our Section," which includes Kentucky, Georgia, and Florida.

We thank the national chairman of the legislative committee for her sympathy and good wishes. We need both.

To begin with, we have no report to make except that a letter has been sent to the Nurses' Examining Board of Ohio for a reprint of rules governing nurses' registration in this state. We are also getting the addresses of the various medical boards of the above mentioned states in order to send for laws governing Physiotherapy.

We have a pamphlet of "Rules and Regulations Governing Limited Practitioners" adopted by the State Medical Board of Ohio, Jan. 4, 1916. Physiotherapy is here listed with limited practitioners as follows:

"(1) Chiropractic, Naprapathy, Spondylotherapy, Electrotherapy, Hydrotherapy, Mechanotherapy, Neuropathy, or any other similar branch of medicine or surgery that may now or hereafter exist, and not here specified.

"(2) Suggestive therapy.

"(3) Massage, Swedish movement, or any other similar limited branch of medicine or surgery which involves manual, physical or mechanical methods of exercise or operation, appliance or treatment that may now or hereafter exist and not here specified.

"*Qualifications.* Those who make applications to practice group 1 or 2 must

"(a) Submit documentary evidence of preliminary education equal to that of medical students prior to entering upon the study of medicine. Documents to be passed upon by entrance examiner of the State Medical Board, in accordance with section 1270 Code of Ohio.

"(b) Submit evidence of completion of a residence course at school teaching anatomy, physiology, bacteriology, pathology, hygiene and diagnosis and other appropriate subjects. Course must cover period of 18 months.

"(c) Pass a licensing examination conducted by State Medical Board after having met requirements in (a) and (b).

"Those who make application to practice under group 3 must

"(a) Submit documentary evidence of preliminary education received prior to entering upon study of limited branch of medicine equal to 8th grade school in this state.

"(b) Submit documentary evidence of completion of a course of study in appropriate branch covering instruction period of not less than four months.

"(c) Pass a licensing examination conducted by the State Medical Board after having met requirements of (a) and (b)."

To most of us this is a sad state of affairs and it goes to show how important it is to get busy.

Standardization of courses of instruction, schools frequently inspected and a definite program for state registration seem of primary importance.

The A. P. A. has the advantage of A. N. A. by being in existence before many of the states have made laws concerning Physiotherapy. A program for state registration made by the A. P. A. would help make the laws of the various states to become uniform and would eliminate much confusion as well as give us something definite to go by.

And when registration is an accomplished fact, we will automatically have a name, Registered Physiotherapist (R. P. T.), to distinguish us from the medical physiotherapist. A. W.

Some splendid papers have been received for the contest and the association is feeling extremely proud of the writing ability of some of its members. Modesty is an admirable virtue but practised we feel sure by too many of the remaining members. In order that we may hear about that pet technique, that series of interesting case reports or whatever it may be that lies close to one's heart and profession, the closing date has been advanced from March first to May first. Remember:

1. Those eligible: All members of the American Physiotherapy Association in good standing March 1, 1930.

2. The subject: Any subject relating to physical therapy.

3. The prizes: First—fifty dollars and a life membership in the American Physiotherapy Association. Second—a life membership in the American Physiotherapy Association. Third—honorable mention.

All papers will be the property of THE PHYSIOTHERAPY REVIEW and may be published at the editor's discretion.

IMPORTANT. After Mar. 1 the address of the Bureau of Appointments will be changed from Garfield Hospital, Washington, D. C., to 233 East 17th Street, New York City.

Signed: C. GRACE COURTER.

Keeping up with personnel and addresses is still one of the most difficult details of those who have to do with the six hundred or so names on the roster. Change of position, change of address, change of chapter committees or appointments should be sent immediately to the secretary, treasurer, general manager and the appropriate national committee chairmen. In this way only can we keep a correct active file or conduct business promptly.

The editor takes this opportunity to amend an oversight in the December issue of THE PHYSIOTHERAPY REVIEW. The third editorial (on page 247) was written by Miss Lucy Minnegerode, Chief Nurse of the Public Health Service. We appreciate her kindness and interest.

The Northwestern University Medical School has two full time fellowships for physicians for clinical research in physical therapy. These fellowships pay $1,200.00 a year, and application should be made to the Dean, 303 E. Chicago Ave., Chicago, Ill. These are planned to give opportunity to the student to fit himself for teaching or practice in this specialty. The minimum time is for one year.

The Role of the Physiotherapist

By Helen Kaiser

Read before the Industrial and Orthopedic Section of the Cleveland Academy of Medicine

In coming here tonight I feel I believe, very much as Mr. Tunney did when he addressed the professors at Yale on the subject of Shakespeare. He had the advantage, however, as he spoke concerning his avocation rather than his vocation.

Physiotherapy, as you all know is not a new science. It began when the first man rubbed his toe after stumbling. As far back as the year 3000 B. C. there was a book written by the Chinese called the "Cong Fu" advocating the treatment of certain pathological conditions by exercise and perscribed manipulations. Hippocrates in 460 B. C. wrote concerning it. Homer sang of hydrotherapy when he told of the wounded Hector's cure by water. Electrotherapy has naturally had its development more recently. It was Franklin who pleased the ladies of the French Court with static sparks. Galvanism and Faradism were discovered at approximately the beginning of the 19th century. To be followed more recently by the high frequency currents. Electrotherapy, however, fell into disrepute chiefly because the medical men interested confined themselves to a narrow field whose results did not justify their wild and extravagant claims.

Modern physiotherapy, to be known as such, had its birth at the time of the World War and ever since the struggle of standardizing methods and establishing educational standards has gone on. Equipment has at last been perfected so that 2 machines meant to produce the same response will do so. Whereas formerly one could never find two that would do the same thing. In fact, one were lucky if he could duplicate a former result with the same machine.

Physiotherapists, though not known as such, also existed before the World War. These for the most part were college trained women, either assisting orthopedic and industrial surgeons in their private practices or working in hospitals as Directors of Physical Education. With the war came an increased recognition of this service and an emergency corps was created. Standards of a necessity were lowered and many entered the field after a brief period of training. A large number of these still remain as excellent experienced workers having added additional training to their war experiences. This emergency measure, however, gave rise to the impression which has been hard to dispel, namely that a physiotherapist could be created over night. The manufacturers of electrical equipment have left no stone unturned to further this idea, offering courses of 1 and 2 weeks to former secretaries, and clerks, in fact, anyone who will enroll, and turning out technicians (well named, too—for button pushers and switch turners they really are) by the score. The American Physiotherapy Association is doing everything within its power to counteract this tendency. The requirements for membership in this Association are graduation from a recognized school of nursing or physical education followed by completion of a course in a recognized school of physiotherapy. These courses are becoming constantly longer and several of our large universities are offering an additional year to their physical education majors. The Association also requires that a person shall have had one year's experience within 2 years of graduation before membership is granted.

All our efforts to maintain a high standard, however, will come to naught if the physicians to whom we are directly responsible do not appreciate the necessity of well trained personal. Massage for example in order to be effective as a therapeutic agent requires training and proper anatomical knowledge. The failure to recognize it as such is due to the inability to distinguish between true massage and a well meant though not well directed rubbing. The well trained physiotherapist is not, as so many would believe, over zealous. She will not trespass into the field of diagnosis, a danger which some physicians consider immanent. In fact she is more apt to be over cautious. She realizes her limitations and just as a good physician will call in a specialist when necessary so will she consult the doctor. It is only the undertrained who are over confident and bumptious. They have no way of judging how inadequate is their knowledge. Consequently we have them advising and perscribing thereby bringing the entire profession into disrepute. Considering this may I therefore urge you to more carefully investigate the credentials of those who apply to you for work and to proceed as cautiously if uncertain of their qualifications as you would in the use of a new and untried drug. It does not follow that because a masseuse or masseur knows how to give a comfortable rub that they can be trusted with a fracture or post operative case where a knowledge of muscle re-education is essential. To me it seems that in this field of muscle re-education, wherein the knowledge of what to give and when to give it or more particularly what NOT to give and when NOT to give it, lies the most important work of the physiotherapist. Regardless of the fact that advice as to how and when to proceed should come from the physician, it still remains absolutely true that a person without proper training, who has too much self confidence and assurance, as these people always have, for a lack of knowledge does not intimidate but has the opposite effect, can do irreparable damage regardless of the strictest supervision. The value of adequately trained personnel can not be estimated. Asked the other day what the minimum physiotherapy equipment of a small hospital should be, I was tempted to reply, one well trained physiotherapist. This does not mean that our modern equipment is useless. On the contrary, it would be impossible to obtain some of our results without it. But if economy is necessary, certainly it should be practiced in selecting the equipment rather than the personal of a physiotherapy department. Of course, the combination of well equipped and well trained is ideal.

As to the person in charge of a physiotherapy department, it should unquestionably be a doctor, providing that a man can be found who has a good understanding of and an interest in all the various branches of medicine as well as those of physiotherapy. Unfortunately, however, there are but too few such men. To me it would seem simpler to have each physician understand the various procedures of physiotherapy and adapt them to his own speciality. For after all there is nothing that goes into the training of the physiotherapist that the physician does not already possess to a greater degree. He may not be familiar with the exact procedure or method of application but certainly, it would take but a short time to acquaint himself with the benefits to be derived from the various measures used. If the medical schools of

to-day would require their students to take a short course in physiotherapy, they would send out their graduates better equipped and prepared to intelligently prescribe it. This would serve a two-fold purpose. It would eliminate in some cases the additional charge necessary to maintain a doctor as head of the department beside keeping the patient in the hands of his original physician. Secondly, it would bring about the happy state when no more perscriptions would come bearing the single word "Physiotherapy," a red flag to every physiotherapist, for she realizes that it forces her into the position of diagnostician in order to give a treatment. It is a role for which she is not equipped and is severely criticised if she assume. If the physician is hesitant about perscribing the best method of procedure, at least he should give her the benefit of his diagnosis and what he hopes to accomplish. It is only through education, education of both physician and physiotherapist that the future of physiotherapy can be safeguarded. And it is in your hands as physicians to set and maintain the standards. The others will fall in line.

No doubt in this audience tonight there are many loyal exponents of physiotherapy. Especially since it is a meeting of the industrial and orthopedic section and one is rather apt to think of these men, that is, orthopedic and industrial surgeons, as the fathers of physiotherapy. But there is no reason why physiotherapy should supplement only the work of the orthopedist. The internist and surgeon should find it equally helpful and indispensable.

If there be any here tonight who in the course of the evening have not been converted, at least to some slight degree to the use of physiotherapy, may I in conclusion quote to them from John Wesley's book, the first in English on "Electrotherapy," "I would beg one thing—it is, that they condemn they know not what, and that they would hear the cause before they pronounce sentence."

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The Association for the Crippled and Disabled

By Rachel Farnsworth

A group of little girls calling themselves the Sunbeam Circle started in 1889 to help the crippled children of Cleveland. Their first work was in the Children's Ward at Lakeside Hospital. The following fall they started a kindergarten for crippled children at Alta House, one of Cleveland's settlements, furnishing both the teacher and the transportation for the children. This was the foundation of Sunbeam School, Cleveland's present school for crippled children. The Board of Education took over the teaching in 1910 and the Sunbeam Circle continued to do the transportation until 1913. During these years the Sunbeam Circle also maintained a summer sewing school for crippled girls.

In 1916 the Sunbeam Circle financed, under the direction of the Welfare Federation, the Cripple Survey of Cleveland, made for the purpose of "finding out the size and nature of the problem; and in the hope of finding practical guidance toward a community plan for promoting the welfare of cripples." Among other interesting facts brought out by this survey was the one that there are six cripples to each one thousand population. Upon the recommendation of the survey in 1918, the Association for the Crippled and Disabled was established, and Sunbeam Circle merged with the Association. In 1920 following the Cleveland Hospital Survey, the Association for the Crippled and Disabled enlarged its activities to establish and operate the Orthopaedic Center to co-ordinate the work for the cripple done by all the institutions in Cuyahoga County. Each department of the Association for the Crippled and Disabled has its own advisory committee.

The purpose of the organization is to devise ways and means for the alleviation of the condition of crippled persons and for the prevention of causes leading to the disabilities: to attempt to insure to every crippled and disabled person in Cleveland the best physical condition he is able to attain, the most useful education he is capable of grasping, and the most suitable employment he is competent to undertake.

The organization is composed of four departments and the Orthopaedic Brace Shop. The Social Service Department is the foundation of the Association. It is responsible for the family and medical case work on each individual client. This department receives all applications for the organization and after a thorough investigation, a social diagnosis is made, and a plan of treatment formulated and carried out. It also acts as a constant go-between and interpreter to other Community Fund agencies. All cases remain active in Social Service after being referred to the other departments.

Our Occupational Therapy Department includes both home-bound clients and our sheltered work shop. This department has more than doubled its production in the last 5 years, although about the same number of clients have been served. The work is given to increase morale and for therapeutic value. The types of work given are adjusted to the client's ability plus the home surroundings and at the same time working within requirements of the doctor's prescription which is secured by the Social Service Department before referral to the Occupational Therapy Department. The men are taught weaving, painting, carpentry, and machine stitching. The women are taught fine and plain hand sewing, machine stitching, embroidery, quilting, and tatting. These home-bound clients are paid for the article that they produce. Rose, a home-bound client, has been known to us for eleven years. Her mother and father are getting old and the money that she has earned as an occupational therapy client has meant much to them. Five years ago she earned $324.47. This year she was able to earn $532.15. Rose is an expert maker of baby garments. It is very difficult to find the article that the client is best fitted to make and also one that is saleable. Gustav is a young man of German descent. He is keen and alert and, previous to his illness, worked as a tool maker and designer, taking courses at Art School at night. He is married and has one child. Now he is confined to a wheel chair and for two years the occupational therapist and the social worker have tried to keep up his morale and find out the things that he was most interested in. The family conditions changed, their scale of living was lowered, Gustav took no real interest in anything. This year he was asked to make transfer monogram patterns, immediately his attitude changed, the worker had found something to arouse him. And now his work compares favorably with that of the professional. Gustav has made his adjustment.

Our sheltered work shop which is known as the Sunbeam Training School employs about 20 girls. Those employed there are too handicapped to compete in industry although the children's clothes that they produce have attained the professional standard. This year we have laid special stress on the cardiac and have found that it is possible, by keeping in close contact with the physician and by giving careful supervision, to secure from this client the ordinary day's production.

Our Sunbeam Shop which is the outlet for our production is located in a downtown sales room. This year our total sales amounted to $32,826.00. By increasing our sales to this extent we have been able to give more work to our clients, thus increasing their incomes and making their lives more liveable and happier.

Our Physiotherapy Department was created to reach those who are unable to go to their respective dispensaries for treatment. Upon the written request of an orthopaedist, our worker gives treatments in the homes, driving on the average of 42 miles a day. The maximum charge per treatment is $1.50. The amounts that the family will pay is decided by the social worker in consultation with the family before referral to the Physiotherapy Department. There is but one worker in this department. Our general average of cases is 25 a month, making about 175 treatments per month. There is a close check-up made between the physiotherapist and referring orthopaedist so that there is a constant turnover in this department.

In 1928 the Rotary Club started Posture Clinics. This was done to stimulate posture work in Cleveland and vicinity. The Rotary Club maintains a social worker who works in close cooperation with the Social Service Department of the Association. This past year the Club has continued its pioneer work in Posture Clinics, completing its sixth clinic. This work has been supervised by our local orthopaedists and carried on by a physiotherapist employed directly by the club. Pictures have been taken of the primary pupils, both before and after

the clinics. The result which have been obtained have been most gratifying and we have reason to believe that several of the Boards of Education will continue the work that has been started in this way. One of the most outstanding examples of our Physiotherapy Department is that of 16 year old Agnes. As a child she had been given a great deal of medical care and the mother felt that everything possible had been done, yet when our social worker found her, she was despondent, out of school, and feeling that there was nothing for her in this world. Mentally she was above the average but her lack of co-ordination made it impossible for her to continue in high school. During the last few months of treatment she has shown a vast amount of improvement, the family is much encouraged and Agnes feels that in time she will be able to enter special training under the Civilian Rehabilitation Service.

The Brace Shop, which is a private business, is operated under our supervision. This shop was built in 1920, its object to furnish orthopaedic braces and all similar appliances upon the order of a physician, to give the patient the best possible service.

The Association for the Crippled and Disabled is a Community Fund agency, receiving financial support through the Welfare Federation, also from the sales of our Sunbeam Shop and Benjamin Rose Institute. Every year as the work of the Association for the Crippled and Disabled progresses, it obtains a better appreciation of the following: "Human nature is much the same whether it be enwrapped in a splendid physique or in a broken body. Back of the handicapped is the man, possessing the same instincts as his ablebodied neighbor, and seeking the same legitimate means of self-expression. Our ideal is to enable him to do his share and thus conferring a benefit upon the whole of citizenry."

The Blood Pressure in Health and Disease

By C. Worster-Drought, M.A., M.D. (Cantab.), M.R.C.P. (Lond.), Physician to the Metropolitan Hospital, and to the West End Hospital for Diseases of the Nervous System, Etc.

Lecture Delivered to the London Group, Chartered Society of Massage and Medical Gymnastics, December 11, 1929
Reprinted by Permission from the Journal of the Chartered Society of Massage and Medical Gymnastics

Blood pressure is a topical subject in these days. We hear a great deal about "blood pressure"; we are told that Mr. So-and-So is suffering from "blood pressure," and we may well wonder what it means. It is my endeavour this evening to tell you a few facts about blood pressure, both in health and in disease.

First, what is meant by blood pressure? What we really mean is the pressure of the blood upon the wall of the blood-vessel that contains it. This implies a force behind the blood; something driving it on, and also some resistance to its onward flow. The force is supplied by the heart, and the resistance is provided by the smaller vessels into which the blood is forced, and by the friction between the blood itself and the wall of the blood-vessel. These factors are summed up in the term "peripheral resistance."

We will take a few simple illustrations before dealing further with the mechanical aspect. If an artery of an animal be cut we observe that the blood spurts out from the cut end in a series of jerks, each jerk corresponding with the heart beat. This constitutes pressure—the fact that blood is forced out. If a vertical glass tube is placed in the cut end of the artery, we will see the blood rise to a certain height in the glass tube—in the rabbit to about three feet, in the dog a little higher. The pressure maintains the blood at this level; a fairly constant level is maintained, the upper surface rising and falling a little with each heart beat. This shows that the blood in the artery is under a constant pressure, which varies a little with the heart beat but never approaches a negative quantity.

Second, we must point out that there are three kinds of blood-vessels—arteries, capillaries, and veins. In clinical medicine the only pressure that really concerns us is the arterial pressure, and this can be measured by means of a special instrument. In the veins the pressure is only very slight; this can be shown by cutting an animal's vein, when it will be found that the blood escapes from the cut end in only a small trickle. This pressure in the vein is not affected in the slightest by the heart beats; in fact, the blood on reaching the veins has lost the intermittent character of its flow. What is the cause of this change in the character of the flow? In passing from the arteries to the veins the blood has to traverse the arterioles—the smaller branches of the arteries—and also the still finer vessels known as capillaries which exist in the body tissues. In doing so the blood meets with continual resistance owing to friction, that is, the rubbing of the blod against the walls of the blood-vessels. Every time an artery divides, although the sectional area of each individual branch is smaller than that of the parent artery, the sectional areas of the branches added together amount to a larger area. Similarly with the capillaries; their sectional area is infinitely greater than that of the aorta—the largest artery we possess. If this increase of sectional area took place without the arteries dividing, naturally we would expect the pressure to be lowered; but unfortunately the lowering effect of the increased sectional area is far more than compensated for by the increase in the total surface area of the capillaries, and therefore in the friction. The cross-section of a capillary is microscopic, and the resistance encountered in forcing the blood through such a system is very great. It would be so even with a fluid such as water; how much greater is it when an attempt is made to force through viscous fluid such as blood, in which are contained particles of solid matter—the blood corpuscles?

Another factor which involves the question of resistance is the velocity of the blood-stream. Owing to the great increase in the sectional area, there is considerable slowing down in the speed of the blood-stream, just as when a river expands into a lake the velocity of the water in the lake is infinitely less than it is in the river. Mathematically, the velocity of the blood is in inverse proportion to the sectional area of the vessel in which it flows. In the aorta the speed is roughly a foot per second; in the capillaries, an inch a minute. On account of this slowing down of the blood-stream, the main resistance to the passage of the blood exists not in the capillaries—that is, in the tissues themselves—but in the arterioles.

The chief factors converting the intermittent flow of blood existing in the arteries to the constant flow of the capillaries and veins, and in maintaining the blood pressure level, are the following:

(1) The contraction of the heart.
(2) The peripheral resistance.
(3) A new factor—the elastic reaction of the artery walls.

The heart we may regard as a pump which forces blood into the circulation at each stroke. If a pump were connected with a perfectly rigid tube full of fluid, every time more fluid was pumped into the tube an equal amount of fluid would be expelled at the free end. If the resistance to this flow were increased by partially blocking the tube it would not affect the intermittent character of the flow, but it would serve to diminish the quantity of fluid pumped in as well as the quantity expelled from the free end. If, however, instead of a rigid tube an elastic or rubber tube were used, the free end being left quite open so as to offer no resistance to the outflow, the result would be exactly the same as with a rigid tube. On the other hand, if the free end of the elastic tube were partially closed by a clamp the resistance would be increased, and the effect would be very different from that of a rigid tube. With each stroke of the pump a certain amount of fluid is pumped in, and owing to the resistance we have created all that fluid cannot escape at once; the result is that part of the force of the pump is expended in distending the walls of the elastic tube. As a reaction to this, the distended tube at once tends to empty itself by its reaction during the interval between the strokes of the pump; consequently a certain amount of fluid is forced out between the strokes of the pump. The outflow from this elastic tube can now be divided into two parts: (1) that part which is forced out in immediate response to the stroke of the pump, and (2) that part which is forced out between the strokes as a result of the reaction of the elastic walls of the tube. If the strokes are repeated regularly before the tube has time thoroughly to empty itself it will

become more and more distended. Greater distension means a stronger elastic reaction and therefore a stronger outflow of fluid between the beats; if this continues increasing until the fluid forced out between the strokes by the elastic reaction of the tube is exactly equal to that entering at each stroke, the outflow will become continuous. This is exactly what occurs in the human body; the arteries, and especially the aorta, are the elastic tubes.

It may be as well here to describe the structure of an artery. If a cross-section is made and examined microscopically, the outer coat—termed the "tunica adventita"—will be found to be made up of fibrous tissues. The next coat is the "tunica media," or middle coat, composed entirely of muscle tissue mixed with a certain amount of elastic fibres. Immediately inside this a thin layer of elastic tissue is placed, and finally there is the inner coat, or lining, known as the "tunica intima," composed of loose connective tissue with an immediate inner lining consisting of a layer of endothelial cells. Therefore, an artery constitutes an elastic tube, and with each beat of the heart—technically known as "systole"—a certain amount of blood is forced into the aorta; in man the quantity is 3 oz. This distends still further the already distended aorta. The elastic reaction of the aorta walls to this further distension sends on more blood to the next segment, the wave extending from section to section with increasing force. This wave of distension felt in the radial artery at the wrist and known as the "pulse," is well known to every one. After each heart-beat the arteries tend to return to their original size and so drive the blood on and on against the peipheral resistance until the capillaries, and finally the veins, are reached. By the time the blood-stream has reached the veins, however, the pressure has fallen to 5 mm. The pressure gradually sinks until just before it is returned to the heart, when it becomes negative. It must be borne in mind that in the human body we are dealing with a closed system of vessels and not open tubes. Consequently the peripheral resistance will be affected by changes in the size of those vessels; contraction of the smaller arteries will, of course, increase the peripheral resistance; not only that, but it will also diminish the total capacity of the system, so that we now have the same amount of blood enclosed in a smaller system. This leads to an increased elastic distension of the walls of the arteries and a consequent rise in the general pressure.

When we speak of "blood pressure" we mean only arterial blood pressure, and the level of this depends upon (1) the force of the pump—the force with which the left ventricle of the heart contracts; (2) the volume of blood pumped into the already distended arteries; (3) the degree of elasticity of the walls of the arteries, and (4) the peripheral resistance. An increase in the output of the heart—that is to say, if the heart pumps more blood into the arteries, provided the size of the arteries remains unchanged—must mean an increase in the degree of blood pressure, but mere quickening of the heart-beat alone does not raise the pressure. Fluctuation in the volume of the blood makes very little difference. Hence drawing off blood from the veins is not of much value in reducing blood pressure, because at once a certain portion of the nervous system—known as the "vaso-motor system"—causes the arteries to constrict, and so keep up the blood pressure. Any loss of blood is almost immediately compensated for by the action of the vaso-motor system, which regulates the general blood pressure and also the local pressure in a particular organ. Its functions are carried on by (1) the vaso-motor centre—a special collection of nerve cells situated in the floor of the fourth ventricle in the medulla—and several smaller centres in connexion with the anterior born cells of the spinal cord; (2) "effector" nerves, which run from the vaso-motor centres to the muscular coats of the arteries, causing them to contract and so narrow their lumen; (3) "receptor" fibres, stimulating the vaso-motor centre into action and causing the effector response. This vaso-motor system is part of the autonomic nervous system.

There are two types of blood pressure: (1) the systolic, which occurs during the contraction of the heart, and (2) the diastolic blood pressure, which occurs when the heart is relaxing between the beats and prior to making another contraction. The systolic blood pressure is synchronous with the contraction or systole of the heart, the diastolic with the relaxation or diastole. It may be asked what means exist of estimating the blood pressure in man? Firstly, there is the trained finger, which is a very poor instrument even at its best, because the most that can be ascertained is that the blood-pressure is probably higher than normal. A second and far more satisfactory method is by means of a special instrument known as a sphygnomanometer. There are two kinds of sphygnomanometer: (1) in which the pressure is measured by a mercurial manometer, and (2) an aneroid, by means of which the pressure is measured on a dial. (Here the instruments were demonstrated.) In testing the blood pressure, the patient should be seated fully relaxed, or preferably recumbent. An armlet consisting of a covered rubber bag is wrapped securely round the arm. The bag is connected with the manometer or aneroid by a rubber tube. When the apparatus is firmly fixed, a finger is placed on the pulse at the wrist, and the other hand pumps air into the bag until the pulse is obliterated. The pressure in the bag when the pulse becomes obliterated is equal to the pressure in the artery and gives us the systolic pressure. The bag is usually filled beyond the point at which the pulse is obliterated. The point at which the pulse is felt to return is also noted, and by taking the average, the correct systolic pressure is estimated. This is known as the "palpation method." There is another method known as the "auditory method," in which one listens over the brachial artery with a stethoscope; this method gives a slightly higher reading than the palpation method.

The diastolic pressure is more difficult to estimate. The procedure is the same as in estimating systolic pressure, but long before the pulse is obliterated the top of the mercurial column in the manometer shows slight oscillations. The point of maximum oscillation is noted and pumping is continued. The air is then allowed to escape, and the point at which the maximum oscillations return is also noted. The mean of the two readings is said to give the disastolic pressure. The diastolic pressure, however, is best estimated by the "auditory method."

We will now consider the normal limits of blood pressure in health. In children under 10 years of age the normal is 100 mm. of mercury; in early adolescence, 110-130 mm.; in middle life, 125-135 mm.; over 60, 145-155 mm. If 100 is added to a person's age, provided they are over 15, this gives us a rough idea of the maximum height that the blood pressure should be. In females the pressure is usually a little lower than in males—about 10 mm. to 20 mm. lower—so in estimating a woman's pressure we may add 100 to the age and then deduct 10 or 15.

There is a danger in relying too much upon the sphygnomanometer, because the normal blood pressure probably varies within much greater limits than is generally supposed; consequently some care is needed in deciding that a blood pressure above what is usually accepted as normal is necessarily an indication of disease.

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We may now consider the variations in blood pressure under physiological conditions. It may vary quite apart from disease. Any mental excitement or undue nervousness usually tends to raise the blood pressure; the excitable person will show a greater variation than the placid one. Another factor is sensory stimulation, such as inflicted pain which may also cause a rise in the blood pressure. Smoking a cigarette by one who is unaccustomed to smoking may cause a slight rise; the same effect may also result from changes in posture, e.g., the pressure in the arteries of the brain is greater when a person is stooping than when standing erect. During digestion the pressure usually rises to a slight extent. Both during and after exercise the blood pressure is slightly raised but returns to normal, as a rule, within half an hour.

We now pass on to the question of high blood pressure, also known as hypertension and hyperpiesis. Here I mean a blood pressure that is persistently increased, not merely raised temporarily. The most common cause of a persistently high blood pressure is either a disease of the arteries known as arterio-sclerosis, or some form of kidney disease, such as chronic nephritis or Bright's disease. Other conditions which may be associated with persistently high blood pressure are chronic rheumatic diseases, gout, lead poisoning, diabetes, meningitis, or any form of intra-cranial hæmorrhage, also purely mental states, such as melancholia and anxiety neuroses. A rise of blood pressure may also occur during and for a time following the attack in epilepsy, migraine, asthma, and angina pectoris.

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To turn to the opposite side of the picture, we have abnormally low blood-pressure or "hypotension." The chief factors giving rise to this condition are, firstly, diminution in the ventricular output, that is, in the amount of blood forced out from the left ventricle of the heart, and, secondly, diminution in the vaso-motor tone. Conditions of low blood pressure may occur under the following conditions: in acute heart failure; in some cases of chronic valvular disease of the heart; in the early stages of Graves' disease and hyperthyroidism, also in shock and collapse. Shock is brought about by undue stimulation of the sensory system—excessive pain or excessive emotion. Collapse, on the other hand, is a condition resulting from the undue removal of a large amount of fluid from the body—in excess hæmorrhage, profuse diarrhea, &c. Consequently we may have hypotension in conditions such as dysentery, cholera, severe vomiting, chronic wasting diseases, and acute infections such as enteric fever, influenza, diphtheria, &c. A very low blood pressure is the rule in Addison's disease, due to destruction of the suprarenal gland, which secretes adrenalin—a substance stimulating the vaso-motor system and tending to keep the blood pressure at a normal level. Hypotension also occurs in nervous diseases, such as neurasthenia, and occasionally in nicotine poisoning. The symptoms are not unlike some of those of high blood pressure, viz., dizziness and headache. In addition, there may be extreme muscular fatigue, the patient becoming unduly fatigued after mild exercise, and sometimes fainting. There may also be insomnia, irritability, and undue sensitiveness to cold, together with numbness and tingling in the hands and feet.

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We now arrive at the question of the treatment of hypertension. The main factor is to try to treat the disease responsible for the high blood pressure. In some obscure cases no obvious disease may be found; we must then look for any septic focus of absorption and induce rest, mental and physical, for adequate periods; also moderate exercise, avoiding sudden exertion. The diet also has to be considered, the chief factor being to avoid excess. No heavy meals should be taken. The best plan is to make each meal as equal as possible, and also to eat the meal dry, fluids being taken only in between meals and not actually with them. Generally, nitrogenous foods and meats and extractives rather tend to increase blood pressure, while white meats—chicken and fish—may well be increased. Greens and fruit may be taken *ad lib.;* alcohol is better avoided, but if inadvisable to omit, whisky is better than wines. Saline purges are of great value and should be taken every morning and calomel once a week. Often a course of spa treatment benefits not only on account of the treatment but also by the rest it entails. It is also to be remembered that warm baths are preferable to cold. There is a special form of treatment carried out at Vichy, which consists of a general massage with sodium bicarbonate, this substance being well rubbed into the skin, preferably with a hair glove. High frequency currents tend to lower the blood pressure, especially when given by auto-induction or on a condensor couch. Diathermy is even more helpful in reducing the pressure down so that eventually, by giving monthly treatment only, the blood pressure can be kept to a fairly normal level. Ultra-violet rays are said to have a similar effect.

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Abstracts

By John S. Coulter, M.D., Assistant Professor of Physical Therapy, Northwestern University School of Medicine

The Arthritides. By L. C. Montgomery, M. D., Montreal, in Can. M. A. J., 21 :5 :578-581, November, 1929.

TREATMENT

Haste has no place in the treatment of arthritis. All definite foci of infection should be removed.

Drugs should be used but not abused, particularly in attempting the relief of pain. Members of the phenazone (antipyrin) group and salicylates are the most valuable. Iodides probably owe their reputation to their effect in cases associated with endocrine disturbance. They are not so useful as thyroid extract. Stock vaccines and other protein injections act by producing shock and are useful in certain cases. The autogenous vaccines are not of any special value.

Massage should be begun very gradually. It is particularly effective when it follows the external application of heat to the affected parts. A physician should control the application. Joints should not be included in general massage. Much damage is done by manipulating joints when inflamed.

Periods of rest should be insisted upon in most cases of arthritis, in conjunction with the other treatments indicated.

Several writers are quite convinced of the value of flushing out the colon, especially when X-ray findings reveal a ptosed colon with sluggish action, and few haustra.

It is interesting to note that the lesions frequently seen in the caecum and colon of arthritics, chiefly dilatation and elongation, are comparable to changes found in experimental animals suffering from a deficiency of vitamin B. Furthermore, arthritic patients seem to do badly when excessive carbohydrate is given, and it appears that carbohydrate is actually essential for the development of the deficiency syndrome above described in animals lacking vitamin B. Graham and Fletcher recently reported arthritic cases with atonic colons which were definitely benefited by low carbohydrate and high vitamin B (yeast and wheat germ) diet. X-ray pictures after this treatment showed improvement in the tone of the large bowel.

A majority of the chronic arthritics show a diminished glucose tolerance blood curve. The delayed sugar removal is an expression of the denial of adequate amounts of blood to the tissues concerned, probably, chiefly, the muscles. This conception fits in with the localized anemic theory, already expressed, as occurring about arthritic joints.

Principles Underlying Diagnosis and Treatment of Focal Infections in Relation to Arthritis. By R. V. Graham in Medical J., Australia, 2:665, Nov. 9, 1929; abst. Jour. A. M. A., 94:1:64, Jan. 9, 1930.

Graham feels that some traumas of fibrous tissue produce their characteristic effects by assisting circulating organisms to localize in that tissue. It is impossible in the present state of knowledge to say positively from roentgen examination that a given tooth is or is not an active source of focal sepsis. Teeth showing osteosclerosis without rarefaction and vice versa have yielded streptococci growing on the patient's whole blood. The mere presence of an organism in a focus does not warrant the assumption that it is pathogenic for that patient. Pathogen-selective cultures are of value as an aid to diagnosis of the activity of a given focus. Patients are very sensitive to such vaccines and only small desensitizing doses should be given. The calcium metabolism shows definite and characteristic changes in these infections. Vaccines prepared from positive cultures on patients' whole blood has been of value in treatment after eliminating the primary focus. The pathogen-selective method is worthy of a trial in other conditions attributed to focal infection. Early treatment is necessary in order to avoid formation of osteophytes and fibrous tissue. Since it is believed that there is a deprivation of calcium in these chronic infections, every effort should be made to promote calcium retention. The sodium and potassium salts of inorganic acids, such as malic and citric acid contained in leaves, roots, tubers and fleshy fruits, are particularly valuable. Sodium citrate in milk assists the infant to retain calcium. If drug treatment is required, sodium calcium lactate is of greatest value. Calcium chloride in large doses causes acidosis. Proteins and fat should be limited, if there is deficient calcium retention; carbohydrates should also be restricted in those cases exhibiting a lowered sugar tolerance. Massage, diathermy and ultra-violet radiation have a place in the treatment of these infections. In severe and prolonged cases of arthritis in which permanent changes have taken place, much relief follows sympathectomy.

A Study of Ultra-Violet Light During Lactation. By D. E. Bunbury, M. B., Chief Clinical Assistant, Electrotherapeutical Dept., Royal Free Hospital, in British J. Actinotherapy, iv:8:164, November, 1929.

In his summary this author says:

The tables clearly indicate that the weighing scales, even when something over a half ton's weight of babies is concerned, cannot be looked to to support a spectacular case for or against light treatment in nursing mothers.

The lesson the author learns from this somewhat arduous investigation is that the averages, numbers and controls set out in these tables will be valuable in answering exaggerated claims and in keeping a sense of proportion in the use of light as a general panacea. She also learns that figures are not the only aim in medicine, for she has vividly in memory many despondent, dejected and debilitated mothers who as a result of a carefully planned individual course of treatment have been able to return to their household duties with something of that intangible "tone" that no measurements and no statistics can set out graphicaly, but which can only be measured by the trained clinician in constant touch with the sick, or by a good mother.

Recent Advances in the Study of Bronchial Asthma. By Leon Unger, M. D., Assistant Professor Department of Medicine, Northwestern Medical School, Chicago, in Illinois M. J., 56:6:426-432, December, 1929.

We have used ultra-violet light treatments for the last eighteen months as an accessory to other methods of treatment. We believe that it helps as a tonic. It seems to be especially valuable in children and undernourished adults. Our results have certainly been better since we started giving these exposures. It is necessary

to emphasize that it has no specific value, but its use seems to help the appetite and build up the system.

In conclusion we wish to emphasize the following points:

Heredity is very important and the closer the relationship the more probable it is that the children will develop one or the other of the allergic diseases; and the closer the relationship the earlier will such symptoms appear.

The conception of allergy with its use of skin tests has been a very big step forward and treatment based on it has enabled most bronchial asthma cases to be either entirely or partially relieved of symptoms.

Skin tests should be thoroughly and completely done or not at all. Testing with ten or twelve materials may be very misleading.

The earlier the diagnosis of bronchial asthma is made and the earlier treatment is begun, the better the prognosis. After emphysema and chronic bronchitis have occurred there is less chance for complete recovery.

Prophylactic treatment can be very successful and demands propaganda against intermarriage between allergic patients, close observations of children of allergic families, and screening such children, so far as is possible, from the more common foreign substances which may precipitate attacks.

Ultra-Violet Radiation Therapy in Erysipelas. By W. H. Ude, in Radiology, 13:504, December, 1929; abst., Jour. A. M. A., 93:25:2004, Dec. 21, 1929.

Ude advocates the use of ultra-violet radiation in preference to antitoxin in the treatment of erysipelas. Apparently excellent results are secured with a minimum of danger, discomfort and expense to the patient. Some of the advantages of the treatment are that it is readily available in practically all communities; it requires only one treatment; it is devoid of danger; it is inexpensive; the results are comparable to those of any other method. The technic of treatment is simple. It can be carried out with any ultra-violet lamp, and necessitates only a knowledge of the efficiency of the lamp. This form of treatment is applicable to ambulatory patients who can be kept under observation in the home. This effects a saving to the patient as it eliminates hospitalization. The data on 91 patients treated by this method are presented.

Ultra-Violet Radiation and Alopecia. To the Editor: In the case of alopecia universalis, commencing as a typical alopecia areata over a number of years and associated with loss of the eyebrows, is ultra-violet radiation of any assistance? What is the accepted theory, if any, as to the causation of this condition in a woman aged about 30? Will you please omit my name. M. D., New York.

Answer. Ultra-violet rays would be of questionable value in a case of alopecia areata totalis of three years' duration. There is no generally accepted theory as to the causation of this disorder. The parasitic, trophoneurotic and toxic theories have not been proved. Emotional strain, nervous shock and severe illness apparently account for some cases. Disturbances of the lymphatic or endocrine systems should be looked for.—Jour. A. M. A., 93:23:1831, Dec. 7, 1929.

Erysipelas in Infancy and Childhood. By John A. Foote, M. D., Washington, D. C., in Southern Med. Jour., xxiii:1:29, January, 1930.

The local treatment of erysipelas is so unsatisfactory that other means of limiting or curing the disease have been long sought. One of the newest of the local methods is the use of ultra-violet light and of the roentgen ray. The fact that the medium-short ultra-violet rays will readily kill bacterial colonies on gelatine plates when these colonies have been exposed for short periods has seemed a logical reason for the use of ultra-violet therapy. The results of such treatment as shown in published statistics do not warrant belief in its specificity, although Patou and others have reported beneficial results from roentgen-ray therapy. Non-specific protein therapy, using injections of milk and horse serum has also been used by a number of investigators. However, in our hands the use of polyvalent streptococcus sera in the past has not been attended with the same degree of success as has followed the use of the more recent specific serum, and this discussion will not attempt to consider non-specific protein therapy.

The Eczema Problem. By John H. Stokes, M. D., Professor of Dermatology and Syphilology, School of Medicine, University of Pennsylvania, Philadelphia, in Amer. J. Med. Sciences, clxxix:1:69, January, 1930.

SUMMARY OF TREATMENT

Search for the external excitant.

Reduce the carbohydrate intake.

Know and grease the ichthyotic.

Look for dermatophytosis of fingers, toes and groins and for pustules.

Try to restore balance by correcting the outstanding errors in focal infection and gastrointestinal troubles.

Expect less of sensitization tests, metabolism determinations, blood chemistry and routine physical and laboratory workups, and more from a full history, an experienced appraisal of type and quasi-empirical management.

Keep water and soap away, and learn to juggle ichthyol and tars, especially crude coal tar.

Use roentgen ray sparingly, the quartz lamp often, autohemotherapy oftener, calcium in large doses on an empty stomach oftenest.

Study the nervous background.

Solar Pigmentation and Heliotherapy in Peritoneal Tuberculosis. By C. Brody in Presse Medicale, Paris, 37:1373, Oct. 23, 1929; abst. in Jour. A. M. A., 94:2:139, Jan. 11, 1930.

It has been noted that prolonged and intense exposure to sunlight has not had the desired effect in the treatment of peritoneal tuberculosis. After a period of distinct improvement the condition has progressed slowly or become stationary; in some patients even a regression was seen. As a result of his personal experience and a review of the literature Brody concludes that daily exposure to sunlight in Grasse (southern France) for a period of from three to six hours, as has been prescribed heretofore is excessive. This time should be reduced considerably, and continuous exposure is also prohibited. According to Brody, overexposure and continuous treatment are responsible for the protracted duration of heliotherapy. He considers it important to interpolate periods of depigmentation and disuse. Association of actinotherapy and heliotherapy permits reduction of the time of exposure to sunlight.

Light Treatment of Tuberculosis of the Eyes. By Wolfgang Hoffman, M. D., Chief Medical Officer, Ophthalmic Clinic, Konigsberg University, Prussia. (Director, Professor A. Birch-Hirschfeld. In British J. Actinotherapy, iv:9:182, December, 1929.

From experience obtained in our clinic during a period of about ten years, we have gained the impression that, in tuberculous diseases of the eyes, the general light bath has mostly a favorable effect—though, it is true, only when applied in conjunction with other methods.

Compared with general treatment, local treatment of tuberculous eye diseases is far more favorable.

Up to the present it has not been proved experimentally that ultra-violet light may cause cataract. From our extensive material (far over 1,000 cases), and over an observation period of more than 10 years, we can add that we have not seen a case of cataract appearing after therapeutic irradiation, although we have frequently had the opportunity of re-examining the patients.

We must exclude infra-red and visible light from the radiations used for therapeutic purposes, until we can avoid any unintentional action by these rays on the healthy part of the eye. On the other hand, the short-wave ultra-violet rays should be present as strongly as possible when irradiating the cornea or conjunctiva. But in diseases of the iris it would be wrong to use rays under 3,000 A. U. for therapeutic purposes, or to leave such a considerable quantity in the radiation that it would not reach the iris, but would remain in the cornea.

In accordance with these considerations, eye irradiation lamps consist of a focal source of light (carbon arc or mercury vapor), a condensor lens, a light filter (usually of blue uviol glass), then a cooling filter of copper sulphate solution to cut out the infra-red radiations. The Kromayer lamp, with suitable adaptors, can also be used. As its visible light is weak, its radiations may in many cases be used unfiltered.

We have tried to define biologically the dose most frequently employed in our clinic, so as to have at any rate some data to go on. This is the amount of rays which in conjunctiva tarsi of rabbits, causes marked dilatation of the vessels after 12 hours, moderate oedema and superficial necrosis. We call this briefly, "a conjunctival dose," and base the subsequent irradiation on it. Before a lamp is used, the time for this dose is fixed, and patients are dosed according to this time.

Among tuberculous diseases of the eye, to which local light treatment can be applied, mention must in the first place be made of diseases of the conjunctiva because in these the advantage of light treatment over other methods was first distinctly shown.

Light treatment carried out lege artis, contains no such dangers to the eye ball as are present with radium treatment while it holds out equally favorable prospects of cure.

A disease which can be certainly removed by light treatment is episcleritis, or scleritis.

The technique is the same for both the foregoing diseases. The nodules are irradiated sufficiently to cause central or superficial necrosis with a wide hyperaemic areola, using the previously-mentioned "conjunctival dose." Under some circumstances, according to the thickness of the tubercle, one and one half to two times the quantity may be given. After reaction has subsided (i. e., three or four days), irradiation is repeated as required. The irradiated place then appears to be flatter, frequently even sunken.

In order to recognize the tubercles in the conjunctiva more easily, and to be more certain that the rays reach them, we use a simple expedient. In U-V light the nodules have a grey-green fluorescence; in the blue light of the irradiation lamp they are, however, difficult to recognize. Therefore, we use spectacles of dark green glass (Hallauer, No. 66), which absorb the light of the lamp, but the fluorescent light from the tubercles comes through. Thus it is possible to see exactly where the point of light must be directed.

Electropherapy in Cutaneous Tuberculosis. By W. Knowsley Sibley, M. A., M. D., B. C. (Camb.), M. R. C. P. (Lond.), Physician to the electrotherapeutic department at St. John's Hospital for Diseases of the Skin, London, in British J. Actinotherapy, iv:8:160, November, 1929.

The galvanic cautery, steam cautery, very hot air, curetting and scarification used to be resorted to, and so also total excision, where the lesion was small and limited. Diathermy applied as a cauterizing agent is a more modern method.

Ionization, especially with a zinc solution, the positive electrode being the active pole, is another method. This is very useful for the treatment of tuberculosis affecting the fingers, toes, etc., when the parts can be immersed in a zinc solution connected to the positive electrode.

Probably more cases of tuberculosis cutis have been treated by ultra-violet light than all other cases of skin diseases put together. Sequiera, who was one of the first in this country to treat lupus with light, and who probably had a larger experience than any other dermatologist of his day, summed up the results of his observations as follows:

Erythema in the irradiated area. This is usually transitory and may or may not be followed by desquamation.

Pigment. The degree varies with the duration and number of exposures and with the individual. The source of light also has an influence. The carbon arc causes deep brown, while the mercury vapor produces a greyish brown tint. This no doubt depends upon the greater penetration of the rays of the carbon arc.

A moderate increase in the body weight was observed in some cases.

A slight increase in the leucocytes was noted in a few of the patients.

An increase in the bactericidal action of the blood, but in some cases there is no change, and it seems probable that this observation may have prognostic significance.

Steady improvement and actual healing without local treatment in surgical tuberculosis, and especially in lupus vulgaris, both of the skin and of the mucous membranes. In lupus the combination of local light treatment with light baths are given in 90% of all cases.

A marked improvement in the general health of the patient.

Effect of Radiant Heat on Production of Actinic Erythema. By F. M. Shattock and M. D. Waller in Lancet, 2:917: Nov. 2, 1929; abst. in Jour. A. M. A., 93:24:1920, Dec. 14, 1929.

Experiments were made by Shattock and Waller to ascertain whether the addition of radiant heat rays had any appreciable effect, either synergic or antagonistic, on the production of actinic erythema, and whether if any such effect is noted, it can be attributed to some physiologic action or physical use. They found that heating tissues by radiation or by conduction (radiator, hot water in vessel) after exposure to ultra-violet radiation diminishes—or suppresses—the actinic erythema and delays its appearance. Heating of tissues by radiation or conduction before exposure to ultra-violet radiation increases the actinic erythema. The time of appearance of the actinic erythema is not appreciably influenced. Heat (radiant heat or hot air draft) applied simultaneously with ultra-violet irradiation diminishes—or suppresses—the actinic erythema and delays its appearance. Differences in color as well as differences in depth of reaction are noticeable. The actinic erythema of the heated skin is more scarlet or vermillion (similar in color to the primary erythema), as compared with the actinic erythema produced by the mercury vapor or water filtered carbon arc light, which is more crimson or carmine. Differences of from 20 to 30 per cent of exposure to ultra-

violet rays are necessary to produce visual differences in erythema. Smaller percentage differences of exposure to a given source of radiation will give appreciable differences in the latent period—i. e., the time elapsing before the appearance of erythema. The diminution of actinic erythema by heating the tissues, either with radiant heat or by conduction, during ultra-violet irradiation, suggests a "physiologic" rather than a "Physical" cause for the diminution observed. The fact that at least equally satisfactory diminution of erythema can be obtained by heating after irradiation with ultra-violet rays cannot be explained on the basis of physical interference or antagonism of the rays. The observed action of ultra-violet rays on the sensitiveness of the skin to thermal stimulation appears to be immediate. It is suggested tentatively that this action may be a factor in determining the degree of actinic erythema in cases in which heat is applied simultaneously or after ultra-violet irradiation.

Radiation and Resistance to Infection. By Albert Eidinow, London, in Medical Jour. & Rec., cxxx:12:695, Dec. 18, 1929.

The irradiation of the skin may be regarded as a photobiochemical reaction and is similar to the exposure of a sensitive photographic plate. The rays of light are absorbed by the superficial layers of the living cells to a depth of 1-1.5 mm.; this action on the living cells produces an inflammatory reaction localized at the site of irradiation. Histological examination shows that there is an acceleration of the blood stream and the blood vessels are engorged. This is followed by an aggregation of the polymorphonuclear leucocytes to the endothelial lining of the superficial blood capillaries. These white corpuscles emigrate through the capillary lining and finally a massive leucocytosis is produced in the interdermal tissue and a fibrous exudation of lymph and serum causes a marked edema of the tissue. At a later stage, desquamation of the stratum coreum occurs and regeneration of epithelial cells with the production of pigment follows.

The irradiated area of skin has a greater tissue immunity than normal cells; this has been proved by experiments on the intradermal inoculation of a virus such as vaccinia into irradiated skin. The clinical observations of the treatment of staphylococcal infection of the skin, have proved that the mild erythema reaction accelerates the healing of boils and carbuncles. This is due to the leucocytosis, the exudation of lymph and the increased capillary circulation at the site of irradiation. Excessive dosage, producing necrosis and edema of the skin, may cause a spreading cellulitis.

The experimental methods of investigation have proved that it is impossible for bactericidal radiations to penetrate in sufficient intensity to destroy bacteria in the epidermis or dermis. The destruction of bacteria in the living organism is therefore not due to a direct bactericidal action of the ultra-violet rays, but to a secondary reaction which follows the absorption of radiation by the living cells.

The irradiation of the skin by rays shorter than 3,100 A. U. increases the bactericidal power of the blood and serum of the organism. This phenomenon originates at the site of irradiation, for the blood circulating through the isolated irradiated area has a higher bactericidal power than the blood of the general circulation. From these observations I have advanced a theory that the absorption of the products of irradiation of the living cells, produces a bactericidal substance which is carried by the blood stream into the general circulation. This can be demonstrated by samples of blood tested in vitro one to four hours after irradiation of the skin, subcutaneous tissue, peritoneum and mucous membrane.

The erythema reaction causes changes in the capillary circulation causing an intradermal polymorphonuclear leucocytosis.

Prolonged irradiation causes an increase in the total number of blood platelets and white cells and a possible relative lymphocytosis.

Radiations may influence the functions of the endocrine system, and in this way the tone of the capillary circulation may be increased.

The intravenous injection of the products of irradiation are in some respects similar in their behavior to the injection of foreign proteins. For after the injection of irradiated blood corpuscles, extracts of testes, liver, suprarenal glands, thymus and lungs the coagulation time of the blood is increased and the bactericidal power of the blood is increased.

The results of irradiation of the skin with short ultra-violet rays produce erythema of the skin. This has been confused with other methods of counter-irritation, and it has been suggested that the biological action of light is due to the effects of counter-irritation.

Infrared, luminous and ultra-violet rays up to 2,850 A. U. were transmitted and could be applied for a prolonged period without the production of skin reactions. Rabbits exposed to this lamp for 48 hours were found to have a greater resistance to a virulent strain of staphylococci, when given a lethal infection dose directly after irradiation.

The study of the effects of ultra-violet rays on the sterols, has proved that following irradiation of ergosterol it is changed to vitamin D and the absorption of this vitamin increases the phosphorus and calcium content of the tissues. Irradiation of the skin has a similar action.

Instruments for Measuring Ultra-Violet Radiation and the Unite of Dosage in Ultra-Violet Therapy. By W. W. Coblentz, Washington, D. C., in Medical Jour. & Record, cxxx:12:691, Dec. 18, 1929.

The methylene blue test is reported to be an all day job in weak sunlight.

The blackening of zinc sulphide (also lithopone) does not appear to give the same results with different batches of material.

The photoelectric cell (containing cadmium, which responds only to wave lengths less than 310 millimicrons) offers a ready means for measuring the intensity of ultra-violet radiation. Reports from users of this device indicate that, in its present state of development, the photoelectric cell is likely to be erratic in its behavior.

Fluorescent photometric devices have been used for measuring the intensity of ultra-violet radiation based upon the fluorescence excited in certain substances when exposed to ultra-violet radiation. Aside from the use in a few special cases but little is known regarding their performance.

We have now to consider the type of radiometer that is non-selective in its response to radiation of all wave lengths, but which is rendered selective by covering the receiver with a filter that absorbs completely radiation of all wave lengths except those used in physiotherapy.

The advantage in using nonselective radiometer is owing to the fact that it can be readily calibrated in energy units (ergs, watts or gram calories) by exposing it to some standard of radiation, such as for example, the standard incandescent lamp issued by the Bureau of Standards.

The writer in collaboration with Mr. R. Stair is using a filter of Corning glass, Corex G 986 A, in combination with a cell of water having quartz windows, which com-

bination transmits over seventy per cent of the vitalizing rays of wave lengths less than 310 millimicrons. It transmits also ultra-violet radiation of wave lengths to 400 millimicrons and a small amount of infrared between 700 and 1,200 millimicrons. However, it appears to be too complex for use as a dosage meter in a practitioner's office.

Infantile Paralysis. By H. Theodore Simon, M. D., New Orleans, in New Orleans M. & S. J., 82:6:340, December, 1929.

Treatment in the acute stage is symptomatic. Serum is probably the best known therapeutic agent and possibly convalescent serum is the best. Next in value is Flexner serum, then pasteur serum, and finally rosenow serum.

In the stationary stage with the described muscle tenderness which lasts several weeks, the best form of treatment is to keep the affected limbs warm, the joints in a neutral position and not to use any massage or the like, this is best accomplished by putting the limb or limbs in plaster of paris casts.

The stage of partial recovery, after the fourth or sixth week, sees us cutting off casts, using splints or braces to maintain neutral joint position and here electrotherapy, hydrotherapy, and physiotherapy are of utmost value.

Remember that the trouble now is with the motor impulse; your motor or muscle is still good and is ready to function when the current is again turned on. So all of the therapies mentioned endeavor to keep the muscle or motor as normal as possible, waiting for nature to throw on the switch.

And so we come to our chronic stage with its permanent paralysis. If support is necessary we should try to get away from braces and use our operations on muscles, tendons, bones and joints to establish stable limbs.

Observations on the Results of Treatment of Scoliosis. By A. E. Flagstad, M. D., St. Paul, in Jour. A. M. A., 93:21:1623-1625, Nov. 23, 1929.

Scoliosis, I believe, is still an open problem; opinions, procedures and statistics of results vary within wide limits.

The majority of patients consult the orthopedist from three to four years after the onset and already have severe curves with structural changes, thoracic distortion and secondary cardiac and respiratory injury that is irreparable.

The problem and result of treatment of the early curvature as compared to the advanced curve is analogous in a measure to that of an incipient and advanced case of pulmonary tuberculosis. Early diagnosis and prevention should be the slogan of the profession. Education of the laity, cooperation of all medical groups, and complete routine examinations during childhood is important.

Conservative treatment if possible should be given a thorough trial, under supervised physical therapy. Standardization of roentgen technic as photographs are being standardized will make a check for comparison of progress more accurate.

Operative procedure has a definite place in the treatment of scoliosis but is not a solution to the problem. It requires skill; it is not without danger, and patients with severe dorsal curvatures as a rule are poor operative risks.

Corrective treatment of the deformity before operation should be attempted; if force is used, prevention of relapse can be aided by the use of an operative cast.

Fractures of the Transverse Processes of the Lumbar Vertebrae. By Paul A. Quaintance, M. D., Los Angeles, in Arch. Surg., 19:6:968-985, Part 1, December, 1929.

The most important diagnostic sign is tenderness localized immediately over the injured process.

Physiologic rest, the duration to depend on the severity of the injury, followed by early progressive active and passive motion are indicated. External heat in any form is comforting and probably favors the healing process. The value of diathermy and other electrical modalities is questionable, especially during the early stages of healing. The deep location of the transverse processes of the vertebrae and the rapidity with which diathermy diffuses through the tissues and circulating mediums (blood and lymph) leave a doubt in one's mind as to its value. Absolute immobilization such as by plaster jacket or back braces, is believed to be unnecessary and inadvisable. Partial immobilization such as by rest in bed, simple strapping with adhesive plaster or a properly fitted corset-belt, with the back in the normal erect attitude should be maintained until resorption of exudates has occurred and callous formation has begun. Passive and active motion should then be instituted and persisted in until a maximum return of function has been obtained. Light massage surrounding but not over the injured transverse processes aids both in resorption of hemorrhage and in healing. The therapeutic lamp is comforting to the patient and exerts a certain psychic effect.

Chiropractors Cannot Legally Use Electricity in Treatments. Medical News Item in Jour. A. M. A., 93:23:1817, Dec. 7, 1929.

The Supreme Court of New Jersey recently reversed the finding of the lower court of Bergen County in the case of the state board of medical examiners versus Harry DeBaum, a chiropractor. DeBaum had been charged with practicing medicine without a license and the first judicial district court, the judge sitting without a jury, found him not guilty. On appeal, the supreme court reversed the finding of the lower court. DeBaum had treated a patient by means of electricity, for which he was paid a fee. The supreme court said that electricity is a dangerous instrumentality unless restrained within proper limitations, and that its use as applied to the human body should be under the direction of authorized persons. Its use in the case for which Chiropractor DeBaum was prosecuted was a part of the art of healing, and in no wise, the court said, involved the function of hand manipulation which, let it be said, is supposed to be the chiropractors' method of treatment. The court was unable to conceive of any hypothesis in this case on which the use of electricity in the manner stated is part of the practice of chiropractic. The actions of Chiropractor DeBaum, therefore, in treating the patient as stated were considered by the court as contrary to the prohibitory provisions of section 10 of the 1921 act.

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